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LEE DROP FRAME TRAILERS

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NEW YORK, MAY 29, 1920

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Cost $1875 to $3950 Less Than Trucks

90% is saved in fuel
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The National Tea Company
The Consumers Refining Co.
Chicago, Ill.
The Cadillac Motor Car Co.
Detroit, Mich.
The Timken Detroit Axle Co.
Detroit, Mich.

The Sterling Motor Truck Co.
Milwaukee, Wis.
The Manitowoc Ship Yards
Manitowoc, Wis.
Fairbanks-Morse Company
Beloit, Wis.
Southwestern Telephone & Telegraph Company
St. Louis, Mo.

Luidteves, Inc.
Amsterdam, Holland, and Dutch East Indies
Fisher Body Co.
Detroit
Towars Creamery Company
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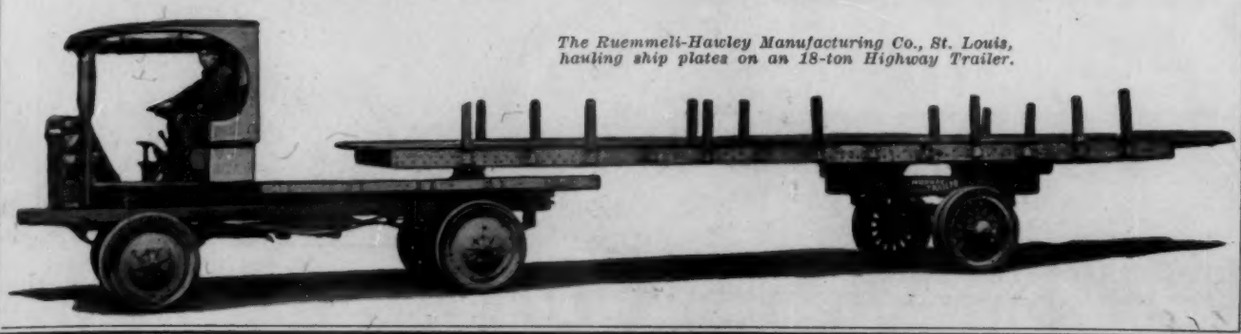
Highway Trailer Costs	$725	$935	$1225	$1545
Highway Trailer Saves	$1875	$2565	$2775	$3955



The Ruemmeli-Hawley Manufacturing Co., St. Louis, hauling ship plates on an 18-ton Highway Trailer.

Vol. 48 No. 20

PUBLIC WORKS.

CITY COUNTY STATE

A Combination of "MUNICIPAL JOURNAL AND PUBLIC WORKS" and "CONTRACTING"

A. PRESCOTT FOLWELL, *Editor* FRANK W. SKINNER, *Associate Editor*

Contributed Articles and Reports

Contributions suitable for this paper, either in the form of special articles or as letters discussing public works matters, are invited and paid for. City, county and state officials are particularly requested to send to Public Works regularly their annual and special reports.

Information Bureau

The Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

NEW YORK, MAY 29, 1920

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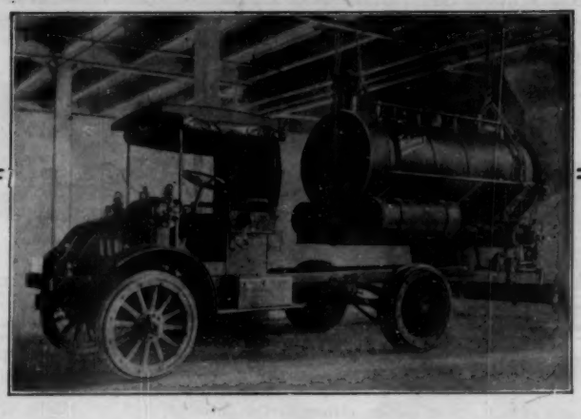

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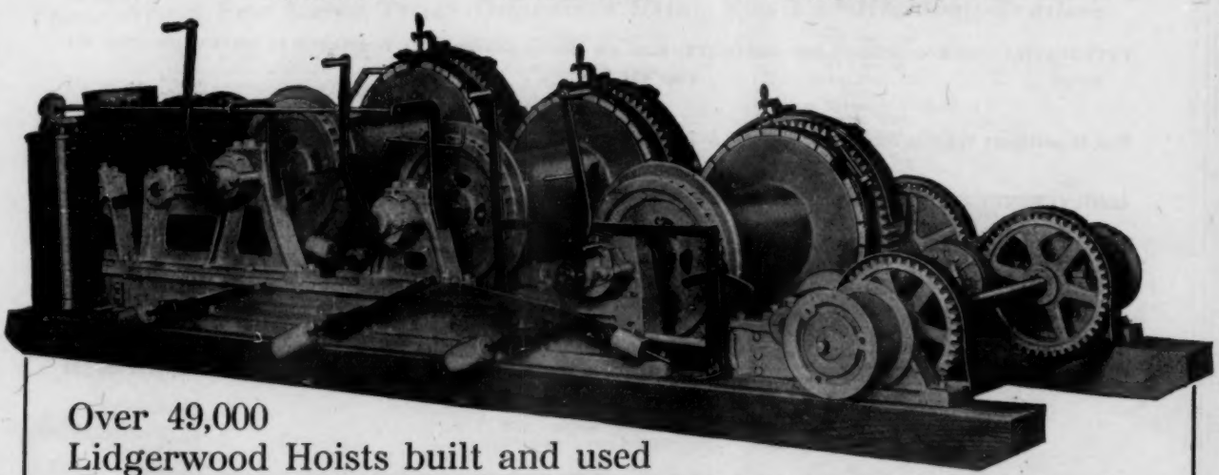

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Vol. 48 NEW YORK, MAY 29, 1920 No. 20

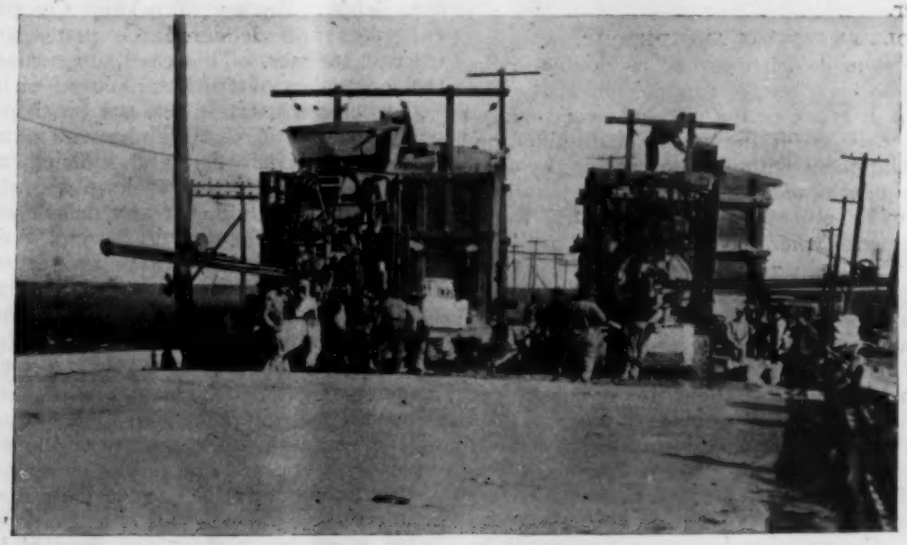
Newark Turnpike Improvement

Building 3½ miles of 40-foot main highway between Jersey City and Newark. Eliminating grade crossings. Longitudinal and transverse drainage on level alignment. Making 300,000-yard embankment on marsh. Handwork in concreting reduced 60 per cent. Duplex concrete plant. Conduits shifted in service.

The Newark Turnpike road, forming part of the main post road from New York to Philadelphia, lies in Hudson county, New Jersey, where about 18,500 linear feet of it, between the Hackensack river and Schuyler avenue, is now being reconstructed and improved under the direction of County Engineer T. J. Wasser, by the Stillman, Delehanty-Ferris Company, New Jersey, contractor. The work was commenced the first of August, 1918, paving was begun about one year later, and the work, which is now well advanced, would probably have been completed during the present year except for unavoidable delays occasioned by scarcity of labor and materials, embargoes and freight congestion.

DESCRIPTION.

The new road will eventually have throughout a granite pavement 40 feet wide on a concrete base with bluestone curbs, and is drained to catch basins 800 feet apart on both sides, which discharge to vitrified pipes from 12 to 30 inches in diameter laid on one side of the road outside the curb line and discharging at different points into creeks. The principal structures are an 8 x 10-foot reinforced concrete culvert 40 feet long for the passage of the waters of Frank creek, several smaller culverts, a crossing over the tracks of the Lackawanna Railroad, a crossing over the trolley tracks on Belleville Turnpike approach, and concrete walls retaining the approach embankments for these crossings.



DUPLEX CONCRETE PAVING PLANT: MIXERS, AGGREGATE BINS AND BELT CONVEYOR ELEVATORS IN REAR.

Most of the road is on tangent, and has maximum curves of about 10 degrees. In general it is made level, with slight artificial grades for drainage. At the Newark end there is a down grade of 1 in 200 for about 400 feet to elevation +7, and there is a succession of low points 800 feet apart at the same elevation. At the center points between these depressions the grade rises to elevation +9. This gives a succession of up and down slopes of ½ of 1 per cent, each 400 feet long, to provide for the flow of water in the drain pipes.

This portion of the road, about 15,000 feet long, is built across the marsh on an embankment 5 feet high above the original surface. This embankment is about 55 feet wide on top, with slopes of 1 on 1½, giving a maximum bottom width of nearly 100 feet. It is pierced by three concrete culverts and twenty cast-iron transverse pipes carrying the drainage from the catch basins on one side of the road to the drain pipe on the other side at low points in the grade. On this fill is laid a concrete base with a wearing surface of granite blocks laid with bituminous joint filler.

QUANTITIES.

The principal quantities include, according to the contract estimate, 304,195 yards of embankment in place, 67,000 square yards granite block pavement, 29,000 square yards Telford macadam pavement (forming a temporary road surface over high fill intended later to become the permanent foundation for the concrete and granite pavements), 14,026 linear feet of vitrified pipe 12 to 30 inches in diameter, 1,300 linear feet cast iron pipe, 16,500 yards of concrete, 32,500 linear feet of bluestone curb, 245,240 pounds triangle-mesh reinforcement for roadway concrete, 15,500 pounds bar reinforcement steel, about 70,000 linear feet of foundation piles and about 250,000 feet of yellow pine and spruce lumber.

TROLLEY SECTION AND DETOUR.

At the west end of the road a double-track trolley line is located on the turnpike and the average difference in grade of the old and new surface is about 3 feet. Here traffic will be maintained on the original alignment without interruption, by constructing the new road in successive longtitudinal halves. A similar process was contemplated for a portion of the road where no trolley tracks are laid, but this idea was finally abandoned except for a total length of about 800 linear feet, as above mentioned, where it was impossible to divert the traffic.

At the Lackawanna crossing the traffic was diverted to a detour constructed in advance of the roadwork and comprising about 1,000 linear feet of macadam built on the original surface of the ground, and about 1,300 linear feet of road built on a pile trestle. After the detours had been constructed and traffic diverted to them, the building of the new embankment on the old alignment was commenced. Construction here was facilitated by the advantageous location of the turnpike between the Passaic river at one end and the Hackensack river at the other end, which permitted nearly all of the embankment and concrete materials to be delivered from barges in the Hackensack river and allowed the embankment to be built from east to west and the concrete foundation to be laid on it as it progressed, while the paving stones were delivered from barges in the Passaic river at the west end of the section.

BUILDING EMBANKMENT.

On a wharf adjacent to the end of the road at the Hackensack river, the contractor installed a stiffleg derrick equipped with clamshell bucket for unloading materials. Most of the embankment fill consisted of cinders hauled in trucks over the line of the road from the east end up to the crossing over the trolley tracks, where the embankment attained a maximum height of about 31 feet above the original surface. The trucks were hired by the contractor and, excepting a few teams employed occasionally, were motor trucks of various types and capacities.

Each truck was carefully measured and numbered and their capacity was rated for water measure or for a 6-inch banking and careful tally was kept on them as they were dumped, the inspector allowing large or small capacity loads or diminishing them if they were not filled to corresponding capacities. Two duplicate slips were made out by which the engineers' and contractors' records were kept. There were in all, at different times, about 600 trucks employed, with capacities ranging from a minimum of 3 yards to a maximum of 14 yards. A number of Pierce-Arrow trucks had their normal measured capacity of 6.8 yards increased to 8.2 yards by the use of side boards. It was found that the smaller trucks could not be employed profitably on this work and they, like the horse-drawn trucks, were generally used only at odd times when they had no other work to do.

About 60,000 yards of embankment at the west end of the road was constructed of sand and loam fill derived from a borrow pit adjacent to the end of the line, where a steam shovel was installed by the Belmont-Gurney Trucking Company, which excavated and delivered the material in a very efficient manner. This company owned a considerable number of trucks employed on other work and whenever a truck was not considered to be in perfect order, it was withdrawn and replaced by one that was in order, and sufficient trucks were always kept in service to keep the steam shovel steadily in operation. If any delays were noticed, the drivers were speeded up, and if this did not suffice, additional trucks were assigned to the work as the length of the haul increased to a maximum of about 2 miles.

The maximum of six 5-ton Pierce-Arrow trucks, which carried 7 yards at a load, were installed and made a record of 25 round trips per truck per day with the minimum haul of only 2 or 3 blocks. The average haul per truck was about 120 to 130 yards in 8 hours. The trucks were equipped with hydraulic dumping lifts and usually distributed the material by advancing slowly as they were dumped, after which the surface was levelled by shovelers and rakers and was compacted by rolling, as specified, with a 15-ton Buffalo-Pitts roller.

The surface of the marsh was irregular and in some places submerged, and the ground was very soft, so that it was difficult to estimate exactly the amount of earth required for the embankment. As a general thing it received about twice as much as indicated by the nominal cross section.

PILE FOUNDATION.

Where the highway passes under the Pennsylvania Railroad tracks, there was so little fill to distribute the loads and protect the surface of the soft ground that the trucks and heavy plant cut through and mired, and it was necessary to drive about 800 lineal feet of full-width pile foundation. Wooden piles 15 to 20 feet long were driven about 5 feet apart on centers in both directions by land machines. The tops of these piles were cut off about 12 inches above water level, the ground was excavated to a depth of 12 inches below the cut-offs, and two ½-inch steel reinforcement rods were laid across the pile tops in each transverse and longitudinal row, after which concrete was deposited around and over the pile tops, forming a platform capable of distributing the load to the piles.

Elsewhere it has not been necessary to make any special provision for settlement, and none of importance has been noticed since the completion of the embankment, the spreading and rolling apparently compacting it so thoroughly that it is subject to little change. Where it was impossible to compact the wide shoulders by longitudinal rolling. a tandem roller operated transversely was used, and this had the effect of causing some lateral displacement of the soil, which resulted in surface movement and in the noticeable tipping of the telegraph and telephone poles.

SHIFTING TELEPHONE CONDUITS.

Near the electric railroad crossing the very important set of conduits containing through telephone wires from the west to Washington were located parallel and adjacent to the alignment, within the limit of the high embankment, and it was necessary to shift them vertically and horizontally and to raise them 5 to 15 feet in a length of about 500 feet. The conduits consisted of 3 tiers of five 3-inch pipes packed together in a rectangle. In changing their position they were supported at intervals of 10 or 15 feet on short cross-beams or slings suspended by differential hoists from light tripods or A-frames. The hoists were simultaneously operated to raise the conduits a maximum of about 12 inches, diminishing to nothing at the ends. While suspended, they were swung transversely clear of their former position and the fill was placed under them, after which they were swung back and the fill placed alongside. They were then hoisted and moved again, and this was repeated until they had been elevated to the required position, aligned and buried. During these operations the conduits developed remarkable flexibility and were sometimes shifted as much as 10 feet out of line without any injury or impairing the service.

RETAINING WALLS.

The high embankments adjacent to the trolley crossings and the Lackawanna Railroad are retained by concrete abutments with wing walls. Adjacent to the Belleville Turnpike there is about 900 feet of face wall on the turnpike side of the embankment, while on the opposite side at this point there was room for the embankment to take the regular slope of 1 on 1½ without retaining. The walls are built on a foundation of spur-braced wooden piles up to 70 feet long, driven in trenches and cut off 12 inches below ground-water level. The tops of the piles project 12 inches into the concrete footing, which is about 12 feet 4 inches wide where the wall has a maximum height of about 32½ feet and has a uniform thickness of 3 feet at the top. The wall is surmounted by a 12-inch coping made 1:2:4, while the mixture in the wall is 1:3:6. Pockets about 4 inches square and 8 inches deep, spaced 8 feet apart, were cored in the coping to receive the lower ends of the pipe rail posts, which fitted loosely in them and were carefully aligned and the holes then filled with cement mortar, holding them rigidly in permanent positions.

The concrete for the walls was mixed in a Lakewood ¾-yard mixer served by trucks, and delivering to a bucket in a wooden hoisting tower about 75 feet high, from which the concrete was spouted through Ransome steel chutes to the forms for

DELIVERING AGGREGATE TO MOVABLE STORAGE BINS WITH INCLINED BELT CONVEYOR.

maximum distances of about 150 feet. When this length of wall had been completed, the tower was shifted about 300 feet and 300 additional feet of wall was built, and the operation again repeated until the completion of the walls. The towers were shifted easily by means of a stiffleg derrick, which also shifted the concrete mixer at a separate operation.

At the high end, the retaining walls are connected by a cross wall forming the abutment of the bridge over the trolley tracks. This consists of skew plate girders and I-beams enclosed in concrete and supporting a reinforced concrete slab.

DRAINAGE.

After the grading and embankment have been completed, the cast-iron transverse drain pipes and the vitrified longitudinal drain pipes are laid in trenches 2 feet wider than the external diameter of the pipes and the catch basins and manholes are built.

All pipes are laid on a foundation bed of 2 to 4-

inch broken stone and the joints filled with a mortar made of equal parts of portland cement and sharp sand. Manholes have brick walls resting on a concrete footing and containing 8-inch arches for the pipes. The cast-iron manhole heads and covers are extra heavy, proportioned to carry a 7-ton wheel load without injury, and weigh 525 pounds each.

CONSTRUCTING CONCRETE BASE.

Aggregate and cement for the concrete base are delivered from the east end of the road by automobile trucks running on subgrade and supplying the materials only as fast as they are used.

The sand and gravel are delivered on barges at the contractor's wharf on the Hackensack river at the east end of the work. They are unloaded by a clamshell bucket operated by a stiffleg derrick that delivers to the 15-yard elevated loading hopper, under which the trucks pass to receive their loads. No storage is provided on the wharf and the number of trucks is varied to maintain about the required regular supply without excess or deficiency at the mixing machines.

Concrete is mixed in two Koehring paving machines and placed by ¾-inch buckets operated on swinging horizontal booms 20 feet long. Although it would be possible for one machine located in the center of the road to concrete the full width, better results and greater satisfaction are obtained by the use of two duplicate machines working side by side and advancing together. In advance of each machine, on the subgrade, is an elevated, portable, hopper-bottom, wooden storage bin of about 15 yards capacity, which is divided into a small compartment for sand and a large one for broken stone. Each of these bins is mounted on four wide-spaced wheels and is provided with two revolving steel chutes which deliver aggregate from the gates at the bottom of the bins directly to the mixing machine.

In front of each bin there is a gasoline-driven Barber-Green elevating and loading machine having an inclined belt conveyor which reaches from the ground to the top of the bin and overhangs the latter. At the lower end of each conveyor the contractor has constructed a wooden hopper into which the truck dumps its load of broken stone or sand. As some difficulty at first resulted from overloading the conveyors, baffle bars were placed in the bottoms of the hoppers to retard the flow of materials and the opening was governed by a sliding gate which enabled the delivery to the belt to be carefully regulated, after which the operation of the elevator was very satisfactory.

The loading skips for the mixing machines are divided into compartments of the right capacity for the respective amounts of stone and sand required, and thus serve as measuring boxes. They are rapidly filled from the bins by gravity so that the mixing goes on almost continuously. A strip of roadway 18 feet long, containing about 20 yards of concrete, is covered at each position of the mixer, and the mixer is moved about 12 times in one 8-hour shift.

The surface of the concrete is spread to conform approximately to the required cross-section as indicated by a pipe frame template that spans the road and gives the elevation as judged by the eye. The mixer gang consists of about 11 men. The mixing machines move forward by their own power and the stone bins, usually empty at the time, are hauled forward by a cable operated by the 15-ton roller. This arrangement of men and plant reduces the amount of hand labor to a minimum and eliminates fully 60 per cent of what the contractor estimates would be required without the appliances and method above described.

The concrete is reinforced with one thickness of American Steel and Wire Company Triangle Mesh No. 126, which is 54 inches wide and is laid longitudinally with a 6-inch lap and is placed 1½ inches from the bottom of the concrete. The bluestone curbstones, 16 inches deep, 5 inches thick and at least 3½ feet long, have the top edges patent-hammer dressed and are set with a batter of 2 inches and supported on a concrete foundation 6 inches thick and 16 inches wide, connected to the foundation concrete in the front and carried up to within 4 inches of the top of the curb at the rear.

GRANITE PAVING.

The granite paving blocks, delivered by trucks from the Passaic river at the west end of the work, are distributed on the surface of the concrete base and are laid on the latter on a 1-inch bed of coarse, dry sand, all joints lapping at least 3 inches. They are carefully inspected as laid, unsatisfactory blocks rejected, and the pavement rammed to an even surface.

The joint filler is made with equal parts of sand and tar, all of the sand passing through a 10-mesh screen, 75 per cent passing a 40-mesh screen, and 95 per cent refused by a 200-mesh screen. The sand is heated to a temperatures of 250 degrees and tar paving cement to 350 degrees before mixing, and the mixture is flushed into the joints at a temperature of not less than 250 degrees. Special care is taken to have the joints thoroughly dry when filled.

A gang of 6 pavers, 2 rammers, 6 joint pourers and 6 helpers lay an average of 500 linear feet of pavement in 4 days.

TELFORD PAVEMENT.

Where the highway is carried on a high embankment at the approaches to the overhead crossings at the Belleville Turnpike and the Lackawanna Railroad, the depth of fill is so great that it is anticipated settlement may continue for a considerable period. Therefore, to avoid possibility of damage thereby to the concrete pavement foundation, the concreting was omitted for the present, and a Telford macadam roadway will be laid that will eventually serve as the foundation for a concrete base and stone pavement uniform with that on the rest of the road.

After the completion of the embankment to the required cross-section, it is rolled with a 15-ton roller and the top brought to a grade 15 inches below the required road surface. After it has been inspected and approved, the bottom course of broken stones of an average depth of 6 inches is set

by hand, the stones being placed on their broadest bases, lengthwise across the road and breaking joints, and are firmly wedged by hand with hammers and projections broken off. Dimensions greater than 10 inches long and 4 inches wide are not permitted, and all flat, smooth surfaces are broken.

The whole surface of the pavement is subjected to ramming with heavy sledge hammers and rolled with a 15-ton roller. A 4-inch course of 1½-inch trap rock is placed, watered and rolled and on it there are spread screenings and loam which are rolled until the stones cease to sink or creep in front of the roller. The surface is finished with about 1 inch of ¾-inch trap rock and screenings in equal proportions thoroughly rolled. This work is accomplished by a gang of about 20 men at the rate of 100 square yards in 8 hours.

The Albany Sewage Treatment Plant

During the first nine months of operation foaming occurred, but was apparently conquered by reversing the flow. The efficiency averaged 67 per cent.

The sewage treatment plant of Albany, N. Y., which is believed to be the largest plant using Imhoff tanks to be found in this country, which was described in the June 17, 1915, issue of Municipal Journal, was put into service about nine months ago. In his annual report for the year 1919, Frank R. Lannigan, city engineer of Albany, briefly summarizes the operation of the plant up to the end of last year. The following is abstracted from this report:

The sewage treatment plant was completed during 1918, but on account of conditions resulting from the war, the beginning of actual operation was deferred until the warm months of 1919 facilitated the beginning of bacteriological action. The sewage was first pumped into the tanks on August 13, two men being started on the same day to go over the line of the intercepting sewer and clean out and open the regulating manholes through which the dry-weather flow of sewage passes from the combined sewers into the intercepting sewer. The flow gradually increased from 5 million gallons a day to 10 million gallons, and by September 18th 15 million gallons were being pumped into the disposal plant.

FOAMING.

On August 28, two weeks after sewage first entered the tanks, septic action started in earnest in tanks 1 to 8, which were those first put into service, this action being evidenced by the marked ebullition of gas in the gas vents. "The heavy matter which the gas raised from the sludge chamber gave off a slight odor. As often as this heavy matter appeared, it was broken up with a wooden dasher. On October 15, this matter, changed in appearance to that of digested sludge, started boiling in the down-stream vents in tanks one and two, the foam rising rapidly and flowing over the vents into the tanks. To overcome this condition, the direction of flow in the tanks was reversed and some of the digested sludge was drawn from the sludge chambers to the drying beds. Three days after this was done, October 24 to October 27, the foam was reduced to twelve inches in depth and in a few days more, it subsided entirely. On November 13, the foam again started, but in the gas vents at the other end of the tanks which, by reversal of flow in the tanks, had become the down-stream end. When it appeared that the foaming would cause these to overflow, the direction of the sewage flow was again changed, more digested sludge drawn off and, as before, the foaming stopped. At the present time there is no evidence of foaming although the ebullition of gas is continuous. The limited experience at the disposal plant so far indicates that reversing the flow and drawing off the digested sludge will stop the foaming, although the stopping may be due in part to increasing cold weather.

OPERATION.

The efficiency of the plant, as determined by the removal of suspended matter from the sewage, has averaged 67 per cent, which is slightly above what was anticipated. During the foaming periods it dropped to 38 per cent, but has risen appreciably since.

There is practically no nuisance caused by odor from the plant as it has never been discernable for a greater distance than 300 yards and then only on muggy summer nights.

The grit chamber is cleaned once a week and it is to be noted that large quantities of cinders and ashes are found in it, which is abnormal and will bear investigation to determine the source. The screen at the entrance to the grit chamber is cleaned four times daily. It catches such things as house cloths, tin cans, garbage, entrails, sticks, etc., which would otherwise clog the pumps.

The disposal of the dried sludge will offer no problem because there is sufficient area adjacent to the plant which can be filled. There have been several inquiries as to its value as fertilizer, but it will require experimentation to make a satisfactory answer. The superintendent of the Bureau of Parks signified his intention to conduct some experiments in the park greenhouses during the winter.

The operating force of the sewage disposal system is now well organized. Up to September 1st the force consisted of three pump operators and one skilled laborer. This force has gradually been increased, as the needs of the system required, to four pump operators, three skilled laborers and eight laborers. Additional men may have to be added in the spring for the work of discharging and disposing of the sludge, maintaining the grounds, skimming the tanks, vents, etc.

Maintaining the intercepting sewer in proper operating condition requires periodic inspection. It is about three and one-half miles in length with nineteen regulating valve manholes besides a num-

ber of direct connections. To operate properly, the regulating valve manholes must allow the free flow of dry-weather sewage into the intercepting sewer. They are automatic but not in the sense that they do not require attention. After each storm it is necessary to send from two to three men with a push cart over the entire route of the intercepting sewer to make sure that all the regulating valves are in proper working order, because it has been found that they sometimes get partially filled with sand, bricks, tin cans, sticks etc.

Cesspools in Toledo

Toledo, Ohio, had about 240,000 population in 1919. In spite of its large size, a very considerable percentage of its population obtain their drinking water from private shallow wells and live in premises not connected with the sewerage system. How many private wells and outside privy vaults there are is not known definitely, a survey of them now being under way, but in carrying out a campaign to enforce the state regulation requiring the abatement of these, 915 cesspools and 521 surface wells were abolished in 1919 and this is believed to be considerably less than half the number of each. In fact, the sanitary police secured the abatement of 2,178 full and foul vaults and issued 2,095 permits for cleaning vaults and inspected 2,624 foul wells or cisterns. Of 154 samples of surface well water examined by the bureau, 105 were found to contain sufficient B-coli and nitrates to indicate their unfitness for domestic use. The Bureau reports "The gradual elimination of the surface well with the installation of city water, the filling of the open privy vault and the use of plumbing, are having their effect on the typhoid fever rate of the city."

Municipality Owned Asphalt Plants

Additions to the lists of municipally owned asphalt plants which were published in our issues of April 17 and May 1 are furnished by W. E. Rosengarten, traffic engineer of the Asphalt Association. He gives us the names of Jackson, Miss.; Minneapolis, Minn.; Providence, R. I., and Roanoke, Va.

Taylorsville Dam Controlling Conduits

Earth and rock excavated to a depth of 100 feet by electric machine with 2½-yard dragline bucket. Blasted by 100-pound charges of explosive in 4-inch holes, removed in lifts 26 feet high and 37 feet high, and trimmed by small charges, sometimes fired 235 simultaneously. Sand and gravel for 55,000 yards of concrete excavated by dragline machine, washed, screened, and stored in gravity plant. Concrete delivered to forms in bottom-dump buckets hauled on flat cars and handled by derricks.

One of the retarding reservoirs now under construction by the Miami Conservancy Commission to control floods in the Miami Conservancy District is formed by the building of a dam across the Miami river at Taylorsville, Ohio.

This dam is 2,980 feet long and 59 feet high. It is made of earth and gravel deposited in position by the hydraulic fill method, as described in the article on "Hydraulic Fill Dam Development for Miami Conservancy District" published in Public Works May 8. This method substantially consists of washing sand and gravel by hydraulic monitors from a spoil bank into a sump, from which it is pumped through pipes parallel to the axis of the dam and there discharged (inside successive tiers of protecting levees) and the water so controlled that the deposition of the coarser material carried by it forms massive shoulders on both sides of the dam axis, which enclose a pool in which, before the water escapes, the sediment settles to build up the solid impervious core which completes the cross-section of the dam.

Through the base of this dam there are four duplicate parallel concrete tunnels 15 feet wide and 19 feet 2 inches high, with a united capacity of 55,000 cubic feet per second, sufficient for the maximum flow of the Miami river in a flood 40 per cent greater than that of 1913. These tunnels and the supplementary construction contain 55,000 cubic yards of concrete.

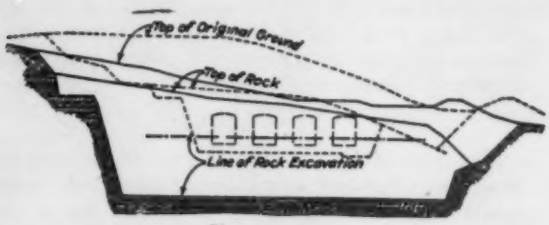
EXCAVATION

The excavation for the dam foundation and for the tunnels was carried down below the bed of the river and is heavier than that for any of the other four dams in the project. The main trench is 380 feet wide and 1,850 feet long on the center line and 2,900 feet long on the east side. It was carried down to a total depth of 100 feet, 77 feet of which was through rock, involving the removal of 523,000 yards of earth and 250,000 yards of rock.

Although the stripping of the overburden from the rock would have been expedited by the use of a fast-operating steam shovel for the upper part and a dragline machine for the lower part, it was decided that the difficulty of co-ordinating the

double excavation and the installation of track equipment was prohibitive, and only about 30,000 yards was excavated by steam shovel and dragline, loaded into 12-yard dump cars and hauled across the river by locomotives to use for the construction of a cross dam to close one end of the hydraulic pool between the side levees. Up to last January about 230,000 yards of the remainder had been jetted, sluiced and pumped, and these processes will be continued for the rest of the sand and gravel.

The upper 10 feet of the overburden is composed of glacial fill or boulder clay, which was easily excavated. The underlying strata extending 20 feet



CROSS-SECTION OF EXCAVATION AND CONDUITS.

or more to the rock consist of extremely tough clay or hardpan in which holes, extending not quite to the bottom of the excavation, were made with well drills, sprung with dynamite, and loaded with about one pound of black powder per yard of earth, which, when fired, shattered the material so that it could be handled by the Marion No. 36 steam shovel. The shovel cut a shelf on which was installed a Lidgerwood electric dragline excavating machine equipped with a 100-foot boom and a 2½-yard basket. The steam shovel also excavated about 6,000 yards of rock at an elevation above that on which the dragline machine was installed.

Holes 4 inches in diameter and 10 feet apart in both directions and not nearer than 5 or 10 feet from the side of the excavation were drilled by two air machines and by three Cyclone machines operated by 7½ h. p., alternating current, 3-phase motors operated at 440 volts, and drilling 50 linear feet per day.

These holes were not sprung, but were charged with 75 to 100 pounds of 72½ per cent gelatine dynamite originally intended for the Italian War Department. About ½ pound of dynamite was used per yard of rock blasted.

The rock was excavated in a 26-foot upper lift extending down to the bottom of the heavy stratum of Cincinnatian limestone, and in a bottom lift of varying height up to 37 feet. The upper lift could not be made higher because, if the holes were carried deeper than the thick stratum, the rock below broke out in blocks so large that it required to be drilled and blasted again in order to reduce it to the proper size for handling by the dragline machine.

After the main lifts had been blasted, the sides and bottoms were trimmed by drilling holes 4 to 6 feet deep with jap and jackhammer drills and loading them with 1 to 2 pounds of dynamite, as many

The cut in the adjoining column shows the work under way on the controlling works of the Taylorsville dam. The gravel screening tower and mixer are seen at the left; the drag-line machine excavating gravel in borrow pit across river. The steel derricks in the center handle the forms and deposit the concrete in them.

as 235 of these holes being fired simultaneously by an electric circuit supplied with 440-volt current from the motor line.

On this work the dragline machine established a record by operating its bucket at elevations varying from 37 feet above the face of the machine to 63 feet below it. Although its long boom would have enabled the machine to excavate a pit 175 feet wide at the base, the extreme width of this excavation made this system undesirable, and the machine was operated on transverse lines zig-zagging back and forth across the wide trench. The rock was loaded by the dragline bucket into 12-yard dump cars and hauled by 40-ton locomotives to the upper and lower toes of the dam, where it was used for aprons and paving to protect the shoulders and give them additional weight and mass.

CONCRETING

The concreting materials were received, prepared, stored and handled at a plant of standard character similar to those installed at the other dams. Sand and gravel were dumped directly into a track hopper, from which they were elevated by a belt conveyor to a screening and washing plant in the top of a tower, permitting the assorted sizes to be distributed by gravity to elevated bins. These bins discharged fine gravel, coarse gravel and sand through chutes and measuring boxes to a concrete mixer, which was supplied with cement from an adjacent storehouse, from which it was delivered in wheelbarrows. Careful tests were taken and great pains were used to secure and maintain the most suitable sizes and proportion of sand and gravel, to minimize voids and to produce the most satisfactory concrete.

Before the excavation had been completed, forms were placed in the bottom of the finished portion of the pit and concreting was commenced there in the rear of the dragline machine and followed the latter as it proceeded along the trench, thus enabling two kinds of work to be done simultaneously and permitting it to be completed at an earlier date than could have been the case if all the excavation had been finished before the concreting was commenced, as would have been necessary if the steam shovel system had been followed.

The mixer discharged the concrete into 1¼-yard bottom-dump buckets on flat cars drawn by gasoline locomotives on a 3-foot gauge double-track service railroad, installed on low trestles built parallel to the tunnel walls. Two steel stiffleg derricks with booms 105 feet long were installed on each side of the track to unload the buckets from the cars and empty their contents into the wooden forms, which were made in large panels handled by the derricks. Eventually the derrick booms were cut down to a length of 90 feet for greater convenience and rapidity of operation.

In order to continue operations during the cold weather, the gravel screening and washing plant was enclosed to protect it from the frost, and the sand and gravel bins and mixing water were heated by steam furnished by an extra boiler.

This work, which is executed under the direction of Arthur E. Morgan, chief engineer; Charles H. Paul, assistant chief engineer, and T. H. Locher, construction manager, has been the subject of several articles in the Miami Conservancy Bulletin, from which the data has been excerpted for the preparation of this article.

War Department Vehicles for Iowa Highways

During the first ten months of 1920 the Iowa Highway Commission received from the War Department 512 trucks, 37 touring cars, 29 ambulances, 17 tractors, two concrete mixers and a considerable quantity of miscellaneous equipment. Within a very short time 288 of the trucks had been distributed to the various counties and to seven state institutions where there was considerable road maintenance. Of the 512 trucks, 376 were absolutely new. The trucks included one-ton, two-ton and 3½-ton trucks of several makes. An invoice of the material received from the War Department gives it a total valuation of $2,000,000 for the trucks and $500,000 for the other equipment.

In order to store and properly care for these vehicles, a tract of land was leased along the Lincoln Highway near Ames, on which were erected four buildings, 52 by 142 feet, constructed of hollow brick tile, rubberoid roofs and cinder floors. An up-to-date repair shop was established in one end of one of the buildings. The cost of these four buildings was about $43,000.

The title and right of possession to all of the equipment remains vested in the Highway Commission, which assigns it to the counties for use in highway work with the understanding that the counties will maintain it in the best condition practicable, at its own expense.

During the latter part of 1919 a number of trucks had been received without body equipment. As the commission had no money with which to equip them with bodies, the trucks were loaned to Chickasaw county under an arrangement by which the county bought and paid for dump bodies and the cost of these was credited to the county by the commission as offsetting rental.

Probably a few of the trucks will be rented to contractors. Rental rates have been established at 40 cents per ton-hour, plus up-keep and driver's cost. Expense of tires will not be charged against the contractor.

It is expected that this season it will require a crew of about 50 mechanics and helpers to care for the equipment, and that not less than 600 drivers will be necessary for handling the trucks now used by the commission and the various counties.

The commission will retain in its immediate possession 272 trucks to maintain a reserve for replacement and also to provide trucks necessary in case it might become advisable to equip and outfit road building crews.

It is estimated that $24,000,000 more is necessary for the completion of the New York State barge canal.

Hockaday, J. W., has been appointed superintendent of water works at Cleburne, Texas.

Achievements of American General Contractors Association

An official statement of the activities of the organization, the results obtained by it in 1919, and what it is proposing to do in 1920.

According to one of their most recent official publications, this National Association is one of general contractors acting through representative committees on legislation, labor, methods, contracts, ethics, transportation, codes, insurance and bonds, construction, development, etc., to guard and promote the interests of general contractors; to represent their opinions throughout the United States, and to concentrate their action on matters of importance.

It comprises four national organizations or divisions of general contractors: Building contractors, highway contractors, railroad contractors and public works contractors, each acting as a separate unit on matters of special interest, yet in co-operation as members of a single organization.

CLASSIFIED ACTIVITIES

It is operating at present seven services, viz.:

Publication service, including a monthly magazine, weekly news letters, and special reports.

Research service for the investigation of any subject of interest to general contractors.

Legislative service to keep members informed regarding state and national legislation and to represent their interests whenever involved.

Contractors' service corporation to act as agent for general contractors in placing insurance and bonds.

Personnel service to act as an exchange of information regarding available men and positions.

Surplus equipment service to act as an exchange of information regarding available equipment.

Members' and speakers' service to provide speakers for meetings of general contractors.

RESULTS OBTAINED IN 1919

It has organized four national divisions of general contractors and fourteen local chapters, including 445 members, and has held two national conventions.

It has followed the progress of between thirty and forty matters of national and state legislation of interest to contractors; secured the passage of the Relief Bill for Contractors on Treasury Department work; fought the government's interpretation of the bond premium clause in government contracts violating agreements made in good faith; united with engineers, architects and others to form the National Department of Public Works Association to urge the creation of such a department; co-operated with the American Institute of Architects in organizing a national Board for jurisdictional awards; co-operated with the National Safety Council in the promotion of safety practices in construction; co-operated with the National Federation of Construction Industries in conferring with the Railroad Administration on behalf of construction interests; secured the co-operation of the American Institute of Architects and Engineering Council to investigate "Payment for Estimating," and secured the co-operation of the American Association of State Highway Officials in the consideration and adoption of improved highway contract provisions.

It has made an exhaustive study and report on compensation, liability and automobile insurance for general contractors, and has undertaken the investigation of joint conference plans with labor, the application of bonus and profit-sharing plans to construction, rental prices on construction equipment, cost accounting essentials, zoning, changes in building codes, the development of standards for labor and materials in construction, the registration of contractors, improvement in present contract provisions, the base rate on steel, and various transportation rulings and classifications, and it has reviewed and given proper publicity to eleven cases of alleged unfair practices toward general contractors.

THE 1920 PROGRAM

It proposes to secure the passage of a relief bill for contractors on Navy Department work and as far as possible in the several states.

To carry the Bond Premium Case to the highest court.

To secure the passage of a bill creating a National Department of Public Works.

To oppose unwise restriction on immigration.

To oppose the prohibition of cost-plus contracts on government work.

To put the National Board for Jurisdictional Awards on a working basis.

To establish an equitable plan for payment for estimating.

To develop a plan for making comparative studies of standards of labor, material and equipment in construction.

To develop a standard rental schedule of equipment.

To establish a code of practice.

To promote an educational campaign among construction workmen.

To secure the adoption of a definite program of better contract provisions.

To give every case of unfair practice in construction the widest public condemnation.

It is estimated that about $5,000,000 will be necessary for the construction of canals for the irrigation of nearly 200,000 acres of land, most of it in Weber and Ogden River districts, Utah, that will require a storage capacity of 117,955 acre feet, and a high line canal and low line canal system.

Notice of Time of Injury from Defect in Street

By John Simpson

The author discusses the court decisions concerning the definiteness and accuracy with which those suing a city for damages caused by defects in streets must describe, in the formal claim, the time at which the accident occurred.

A usual statutory provision requires, as a necessary preliminary to an action against a municipality for injuries due to defects in streets, a notice of the claim, stating the time and place of the injury, and, ordinarily, the nature and cause thereof. The necessity for a correct statement of the place of injury has already been dealt with in our columns. (*Municipal Journal*, Dec. 21, 1918.) These statutes make the statement of the time just as important as the statement of the place of the accident, and the results of the failure to compiy with the requirement because of an erroneous statement of the date of the accident cannot be avoided by saying that the notice is correct in form though erroneous in fact. All the cases on the subject recognize either directly or by implication the necessity not only of *a* statement of the date of the accident, but also of a substantially *correct* statement of that date.

Time is often an important element in the identification of a given transaction. For all practical purposes, an event which begins and ends on any given day is quite distinct from, and quite other than, an event which begins and ends on another day. Doubtless the extent of an injury might with reasonable care be identified without a statement of the time, but since legislatures for reasons of their own have seen fit to prescribe and make essential the statement of the time of the injury, that requirement must be substantially complied with.

The natural and ordinary method of stating the time of an event which begins and ends within the compass of a day is to state the day on which it occurred, together with the month and year, unless more particularity is required by the statute. This is what the legislatures probably intended when the words "time of the injury," with nothing more, are used in the statutes.

The information sought to be furnished as to the time of an alleged accident is, of course, to afford the municipality an opportunity to check up and verify the injured person's movements on that particular date, and to prove, if it can, that he or she was not in that part of the municipality and sustained no injury on the date specified. In order to make the statutory notice effective and of practical value to the city, the language of the statute should be held to be mandatory, and especially as to the true time of the injury. Canter v. St. Joseph, 126 Mo. App. 629; Hackenyos v St. Louis, (Mo.), 203 S. W. 986; Murray v. Seattle, 96 Wash. 646, 165 Pac. 895.

WHEN THE COURT DECIDES.

When the question arises whether the time of the accident is described with sufficient certainty in the statutory notice, who is to determine this question, the court or the jury? If the question is to be determined solely from a consideration of the difference between the time shown by the evidence and that stated in the notice, it should be determined by the court as a matter of law; but if, in deciding the question, it is proper to consider the size of the city or town and the facilities for making investigations as to such accidents, as well as the frequency of similar accidents, and other facts disclosed by the evidence, for the purpose of ascertaining whether the notice given actually served the purpose for which it was intended, and informed the city of the particular accident with such certainty as to enable it to make proper investigation, then it would present a question of fact for the jury. Briefly stated, the rule sanctioned by the weight of authority is that when the time of the injury is shown by the undisputed evidence, and that time differs from the time stated in the notice, the question whether the difference so shown is substantial or material is a question of law to be decided by the court, Ft. Wayne v. Bender, 57 Ind. App. 689, 105 N. E. 949; and it is eror to submit it to the jury; Weisman v. New York, 219 N. Y. 178.

LIMIT OF INACCURACY IN STATING TIME.

What difference between the time stated in the notice and the actual time will make the notice ineffectual? It is clear that where the notice entirely omits to state any time it will be insufficient. Forsythe v. Oswego, 107 App. Div. 187, 95 N. Y. Supp. 33. And the giving of an impossible date likewise makes the notice ineffectual. Batchelder v. White, 28 R. I. 466, 68 Atl. 320. Where the year was omitted, it was held that the notice was defective, although the day and month were stated, and the notice was properly dated. White v. Stowe, 54 Vt. 510. A difference of one month is undoubtedly fatal to the notice. So, where the time in the notice was January 29, 1909, while the accident occurred on December 29, 1908, the notice was held defective. Carter v. St. Joseph, 152 Mo. App. 503, 133 S. W. 851. To the same effect is Ouimette v. Chicago, 242 Ill. 501.

An error of a week has also been held fatal. McHenry v. Kansas City, 101 Kan. 180, 165 Pac. 664. This was a case of alleged injury from slipping on ice on a sidewalk. The notice named January 12 as the date of the accident. Naturally, the court said, the city officials would inquire as to the existence and quantity of ice on the sidewalk on January 12. The accident occurred seven days later. With the variable Kansas winter climate, it was entirely unlikely that the weather conditions of January 12 would be the same as those of January 19. "The time—not necessarily the hour, but the date—is well known by the plaintiff. Therefore the statute requiring the statement to give the time must be complied with. To say that the claimant may name a false and misleading date instead of the correct one—here the discrepancy was a week—'is not,' as the Connecticut supreme court says, 'to construe the statute, but to repeal it.' Gardner v. New London, 63 Conn. 267, 28 Atl. 42 * * * . We note that in Murphy v. St. Paul 130 Minn. 410, 154 N. W. 619, a misstatement of one day in the date given in the notice was held not fatal to a recovery. That was a case where the injury was caused by a defective sidewalk. Perhaps a distinction could be based on that point. A defective sidewalk would remain defective until the fact of the defect could be investigated. Ice on a sidewalk would only remain until the weather moderated."

In Rauber v. Wellsville (1903), 83 App. Div. 581, 82 N. Y. Supp. 9, it was held, in effect, that the fact that the officers of the municipality were not misled by the notice or that the municipality was not prejudiced by the defect or inaccuracy of such a notice is not material. A notice stating that the injury occurred "on or about" a specified day, the day specified being the true date of the injury, is sufficient. Murphy v. Seneca Falls, 57 N. Y. App. Div. 438; Comstock v. Schuylerville, 139 N. Y. App. Div. 378; Brenner v. Chicago, 182 Ill. App. 348.

Most of the statutes on the subject require that the notice shall "state the time" of the injury, without any qualifying words. Some statutes, such as that of Indiana, provide for "a brief general description of the time," place, cause and nature of the injury. Construing such a statute, it is held, Ft. Wayne v. Bender, 57, Ind. App. 689, that a general statement of the time of the injury would not require a particular statement as to whether the accident occurred in the forenoon, or in the afternoon, or in the evening of a given day, nor would it require any statement as to the hour or the minute of the day upon which the injury occurred; but reasonable certainty requires that the date of the injury, including the year, month and day of the month should be given. The notice, to be sufficiently definite, must, as a general rule, according to the great weight of authority, give the date upon which the injury occurred, and the evidence must conform to the date stated in the notice. A case might arise, of course, where the injury occurred so near midnight of a given day as to render it uncertain upon which of two days the injury actually occurred. In such a case, proof that it occurred within a short time before or after midnight might be held sufficient to support a notice stating that it occurred on either of these days.

A notice stating that the accident happened on the 16th day of April was held insufficient to permit a jury to consider an accident occurring "at any time between the first of April and the last day of May," as this practically allowed of a variance of forty days. Shaw v. Waterbury, 46 Conn. 263. And in a New York case a variance of ten days was held fatal to recovery. Rader v. New York, 97 Misc. 648, 648, 162 N. Y. Supp. 275, and in a very recent case, Weisman v. City of New York, 219 N. Y. 178, 114 N. E. 70, the New York Court of Appeals held that a variance of eight days, between August 20 and August 28, was fatal. A notice that an accident which occurred on the 2nd of May occurred on the 5th of May, an error of three days, was held fatally defective, although the city was not misled thereby. Gardner v. New London, 63 Conn. 267, 28 Atl. 42.

Where "the time" is required to be stated, that is held to mean the day of the injury, and that, it is held, must mean the true day. "There can be only one 'time' of the injury, and that is the one day on which it occurred." If the notice need not set forth the true day, then it may set forth any other day at the whim of the plaintiff, for if the day of the injury is once departed from there is no guide as to what other day shall be stated. The statement of the true day is not only deemed important to the party liable for the purpose of identifying the injury, but also that he may know whether the notice has been given within the proper time. In cases of injury from ice and snow this becomes quite important, because the notice must be given within so short a time after the injury. If the notice may set forth any day as the day of the injury, such a notice as to time is not only useless, but it is positively harmful and misleading. It not only gives no information as to the time of the injury, but it gives false information. The true date must in nearly every case be well known to the plaintiff or to his friends or agents, or it can be easily ascertained, and it is no hardship to require him to state it truly in the notice. Gardner v. New London, 63 Conn. 267, 28 Atl. 42.

A notice which states that the injury occurred on the day after or the day preceding that of its actual occurrence does not constitute a substantial compliance with such a statute. In Benton v. Montgomery (Ala.), 75 So. 473, where a notice which stated the date as December 18, while the injury was sustained on December 17, was held defective, the court said: "If it should be regarded as a sufficient compliance to give notice of a claim as having arisen on the next day after it in fact had arisen, the clear mandate of the statute that the day should be given would be unjustifiably avoided." Hackenyos v. St. Louis (Mo.), 203 S. W. 986; Author v. St. Joseph, 152 Mo. App. 180; Barron v. White, 29 R. I. 482.

THE HOUR OF THE DAY.

In such cases it is not required to state the precise minute or hour of the injury, and according to some courts, this is "all that can be allowed without defeating every conceivable purpose which the statement of the time was intended to subserve." Gardner v. New London, 63 Conn. 267; Lilly v.

Town of Woodstock, 59 Conn. 219; Birmingham v. McKinnon (Ala.), 75 So. 487; Donnelly v. Fall River, 132 Mass. 299; Savory v. Haverhill, 132 Mass. 324; Wilton v. Flint, 128 Mich. 157.

The Alabama statute requires "the day and time" to be stated. Holding a statement that the injury occurred on May 20, 1914, without alleging the time of day, to be sufficient, the Alabama Supreme Court said, McKinnon v. Birmingham, 196 Ala. 56, 71 So. 463: "When the purpose of the statute as above set forth is considered, we are persuaded that a claim, stating a specified day of a given month and year, is a substantial compliance with the statute, and it was not the intention of the lawmakers to require a more specific description, either as to the hour or whether it was night or day."

The Illinois statute on the subject requires the notice to state not only the date but "about the hour" of the injury. In one case under the statute the claimant stated the date but omitted the hour. The action was dismissed, the court saying that it knew of no case which would form a precedent for a court reading a statute which requires a statement of "the date and about the hour of the accident" as though the words "and about the hour" were lacking. Zycinski v. Chicago, 163 Ill. App. 413. Under this statute a statement that the accident happened "some time ago" is not sufficient. Lucas v. Pontiac, 142 Ill. App. 470. And an error of a month in the date is of course fatal. Ouimette v. Chicago, 242 Ill. 501, 90 N. E. 300.

In one notice under the Illinois statute the hour was definitely stated as 5:30 in the afternoon, while the proof showed that the accident occurred at 8:30 in the evening. The notice was held insufficient because, while it is unnecessary under the statute to state the exact hour, but only the approximate hour, yet, "when the statement does undertake to state the hour definitely, and states it definitely wrong, then such statement becomes detrimental instead of beneficial to the city, for the purpose for which it is required by the statute; that is to say, instead of giving the city as nearly a correct idea of the hour as the claimant could give, it suggests a positively incorrect idea on that subject, and so, instead of leading the city to the facts in its investigation, it misleads it. So far as the practical effect is concerned, the city is in no better position than if no hour had been stated, and a failure to state the hour of the accident renders the notice fatally defective." Swenson v. City of Aurora, 196 Ill. App. 83.

CLERICAL ERRORS.

One notice omitted the year, giving the day and month as Tuesday evening, September 28, the notice being dated October 2, 1915. An examination of the calendar showed that September 28, 1915, was Tuesday. The court held, Schmidt v. Manchester, 92 Conn. 551, that the notice was sufficient as it was "hardly conceivable that any person in the exercise of ordinary care and intelligence could have been misled as to the date of the accident because the notice failed to directly state that it occurred in 1915."

Another case of clerical error appears in Canter v. St. Joseph, 126 Mo. App. 629. The notice first stated the date of injury as the 4th of the month, but subsequently referred to it as the 11th, the true date. It was held that this was a substantial compliance with the statute.

DATE NOT REQUIRED BY STATUTE.

Where the statute providing for notice of claim to the municipality does not require a statement of the date of the accident, a mistake in the date of one day will not invalidate the notice, if the municipality is not misled to its prejudice thereby. Murray v. Seattle, 96 Wash. 646; Marcotte v. Lewiston, 94 Me. 233, 47 Atl. 137; Killeleagh v. Brantford, 38 Ont. L. Rep. 35, 32 Dominion L. Rep. 457.

DISCOVERY OF TIME BY MUNICIPALITY.

Apparently, in view of the peremptory language of such statutes, an indefinite or erroneous statement in the notice as to the time of injury cannot be cured by evidence showing that the municipality, through its officers, has obtained accurate knowledge of the time. Ft. Wayne v. Bender, 57 Ind. App. 689; Ouimette v. Chicago, 242 Ill. 501; Carter v. St. Joseph, 152 Mo. App. 503; Gardner v. New London, 63 Conn. 267. In Lucas v. Pontiac, 142 Ill. App. 470, the court said: "It would violate the provisions and defeat the purpose of the statute if the plaintiff was permitted to supply the deficiencies of the written notice by proof that the city or its officers had oral information from her, or from any other source, of the time, place or cause of her injury."

The insufficiency of the notice as to statement of time of injury cannot be waived by the municipality by inquiring into the claim and negotiating for its settlement with the claimant; Batchelder v. White, 28 R. I. 465, 68 Atl. 320; Lucas v. Pontiac, 142 Ill. App. 470; 63 Conn. 267; and it is not waived by the claimant's being examined before trial by the corporation counsel, when she stated the true date. Weisman v. New York, 219 N. Y. 178; 114 N. E. 70.

Jail Inmate Threatens Chicago Strike

"Big Tim" Murphy, now in prison awaiting trial for murder complicity, has written to the Chicago department of public works demanding a wage of $4.20 per day for all street cleaners and threatening an immediate strike if it is not granted. About 1,000 of these men who, it is stated, have been compelled to contribute $1 a month to "Big Tim" to hold their positions, and 4,500 city employes in the street and other departments threatened to go on strike immediately if their demands are not granted. Ashes and garbage removers who have been paid $9 a day demand $11, truck drivers demand $8 minimum, and all street repair men demand a general increase of 25 per cent. If the demands are not met the men threaten to cut off the city's light and water notwithstanding the fact that the city has no money with which it is possible to meet the demands and cannot borrow any until new tax legislation is enacted.

The bill for the licensing of professional engineers and land surveyors in New York State was passed by the Legislature April 24, and signed by the Governor May 14, 1920.

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Damages for Street Accidents

Reports of court cases seem to indicate that more suits are brought against municipalities for the collection of damages on account of injuries caused by alleged defects in streets than of any other one character. The defects include icy sidewalks, projecting flag stones, holes (from minor depressions to large excavations), posts and other obstructions, etc. In defending such suits, a municipality is of course not only justified but bound in duty to the taxpayers to use every precaution to prevent the collection of any damages to which the plaintiff may not legally be entitled.

In providing for the collection of such damages, most of the statutes provide that the city be given sufficient information concerning a claim presented as a basis of suit to enable it to check up the statement of the plaintiff and satisfy itself as to the truth of his statements and justice of the claim. To make this possible, it is generally required that the plaintiff state just where the accident occurred through which his injury was occasioned, what caused it, and the time at which it occurred. Each of these is necessary in order that the city may itself investigate the claim and prepare its defense.

There may easily be some cases in which the time would seem to be unimportant, but there would be others in which it would be very important. For instance, injury on a slippery sidewalk may be claimed to have occurred on a day when the weather conditions made the presence of ice impossible; or contributory negligence might be provable in bright sunlight, although it might not be a justifiable defense if the accident occurred on a very cloudy day or at night.

Because of the frequency of suits of this kind and their consequent importance to municipalities, we published in our issue of December 21, 1918, an article discussing the court decisions concerning the definiteness with which the place where the injury was incurred must be described by the plaintiff. In this issue we supplement this by another discussion of the definiteness and accuracy with which the *time* of the accident must be stated in the notice of suit given to the city. The general tenor of the various decisions cited appears to be that the day, month and year must be given correctly and that failure to do so may form a vital defect in the notice. As to the necessity of stating the hour, the decisions do not seem to be so pronounced, although if an incorrect hour is stated, thus definitely misleading the municipality, this has been considered fatal to the claim. Altogether, it will be worth while for every municipality which is subjected to damage suits of this kind to study these two articles carefully; also it will be advantageous for those about to present such claims to utilize the information there given, in order that their claims may not be thrown out for insufficiency or error.

Pile Foundation for Highways

The concrete on which a pavement wearing surface rests is commonly called the "base," the term "foundation" being less often used. If we consider that there is a technical reason for the distinction made between these words, then a part of the Newark turnpike described in this issue uses its concrete slab as a true foundation rather than a base. For in this case the concrete is reinforced and transmits the traffic loads to foundation piles, with practically no reliance upon the soil for support.

The supporting of a roadway pavement by bearing piles is unusual, and adds considerably to the construction cost. It is justified, however, by the fact that the pavement rests upon unstable marsh land without the intervention of an embankment to distribute either the load upon the soil or the effect upon the pavement of the uneven settlement of the soil; and that the pavement is of a non-flexible type. Probably by no other practicable method could the engineers prevent the occurrence of uneven settling, which would necessitate constant repairing and interference with traffic, the ultimate cost of which would be much greater than this construction. This has been demonstrated by experience with other roads on these New Jersey meadows.

Political Candidates Questioned by Engineers

In this issue of Public Works, announcement is made of two important communications formally addressed by engineering associations to candidates for public office, requesting their replies to a series of questions defining their positions on important subjects relative to public works and policies of various kinds.

These include the creation of a National Department of Public Works; the reclamation of waste lands; budget appropriation of public funds, and engineering representation in the Interstate Commerce Commission, referred to the presidential candidates. Also a series of questions relative to licensing engineers; bond issues for municipal improvements and for good roads; and the improvement of public lands, are submitted to all candidates for public offices in West Virginia.

These questions are all on major subjects of immediate importance to the citizens and should have no political bearing. They have been carefully prepared to indicate, in a conservative manner, some of the positive changes and improvements that should be undertaken and are presented with dignity so that they can readily be answered in the affirmative without constituting unreasonable pledges but will still meet the issue unequivocally and provide a proper basis for executive policy if the candidate is elected.

These questionnaires have the weight of a large number of disinterested, intelligent citizens, many of them professionally associated with the public welfare and especially with public construction, who are entitled to a statement of the views of the candidates asking their suffrages. It will be difficult to refuse a straightforward answer to these questions and, even though some of them may not be answered in the affirmative, the replies will eliminate ignorance and provide a clear basis for the support or opposition of the candidate and for his consistent obligations if elected.

It is, therefore, to be presumed that none of the candidates will fail to reply to the questions and that these replies, perhaps with comments and annotations, will be widely circulated by the proponents of the questionnaires, thus accomplishing considerable missionary and educational good.

This method, conservatively applied by responsible bodies of public spirited experts especially qualified to deal with the topics mentioned, are, we believe, new in the engineering profession and we shall look with interest for beneficial results that should encourage extended action of this sort in future.

Relation of Architects and Engineers to Important Structures

The question whether an architect or an engineer should have charge of the design and construction of bridges and other important structures was brought to the attention of Engineering Council by the American Society of Civil Engineers and by the American Institute of Consulting Engineers. Each organizations had adopted formal resolutions expressing its belief that engineers should have charge of design and construction of bridges and other structures in which engineering elements predominated. Occasion for these resolutions was given by the engagement not many months ago of architects to have charge of the design and construction of certain conspicuous bridges in Pennsylvania. This perplexing problem has been considered by the joint committee of Engineering Council and the American Institute of Architects. Whether engineer or architect has the primary engagement for a project on which the services of both are needed, an important requirement, frequently neglected, is that the collaboration should date from the beginning. Each should be given fair credit for his contribution to the completed structure.

After a full and frank discussion of the points at issue, the committee, composed of three engineers and three architects, all of whom were present, unanimously concluded that the special conditions surrounding each case should determine whether an architect or an engineer should be selected to have charge. The safety, adequacy, durability and suitability to purpose of any structure, whether bridge or building, are axiomatic. Under certain conditions structures should in addition be aesthetically excellent. In such cases the design must involve, therefore, collaboration between engineers and architects. Whether the engineer is chief and the architect associate or vice versa is an administrative detail of relative unimportance. Either combination should secure satisfactory results.

Immigration Increasing

The Washington correspondent of the *Pittsburgh Press* writes that at the present weekly rate the arrival of aliens in the port of New York alone is at the rate of about 625,000 a year. The weekly total, however, is constantly increasing and the 1920 immigration figures may reach 750,000.

The condition is considered remarkable in view of the fact that the failure of the United States to ratify the peace treaty bars all immigration from Germany, Austria, Hungary, Turkey and Bulgaria. The literacy test, now rigidly enforced, also operates to restrict the admission of aliens as well as the wartime regulation requiring aliens to present passports from the governments of the countries from which they are emigrating.

The state department has reports that application of aliens for the vise of passports to this country are rapidly increasing. The largest number of immigrants now is from Italy, Poland, the British Isles and Norway and Sweden sending large quotas of the most desirable class of immigrants.

Frederick A. Wallis, recently appointed Immigration Commissioner, but not yet confirmed by the Senate, says:

"When I become Commissioner of Immigration, the doors of Ellis Island will swing both in and out —in for the oppressed of other lands who have come here with the firm purpose of becoming loyal American citizens and eternally out and impassable for the Reds, anarchists and Bolsheviki.

"What the United States needs is more immigration and immigration of the right kind."

Reports from Malone, New York, immigration officers state that during the war every train from the north brought a large number of immigrants from Canada, but that now the number is very much reduced.

It is officially reported that the arrival of immigrant aliens during the week beginning May 3 numbered 12,674, and deportations numbered 4,310.

A large number of Dutch farmers and their families, bound for Iowa and South Dakota, arrived in New York on the Noordam, May 16.

More than 1,000 Irish immigrants, mostly young men and women, arrived in the port of New York on the Baltic and Caronia, May 19, and report that thousands more are waiting for transportation to this country.

Disposal of Municipal Wastes

By Joseph Goder

Continued from page 446 of the previous issue. In this instalment the author discusses dumping refuse, reclaiming its food value, and utilizing it as fertilizer.

DUMPING OF REFUSE.

The oldest and most obsolete method is to remove the refuse and dump it either at special designated dumps or into the water. This malpractice is still widely used. Not only is this proceedure a nuisance, but it endangers the health of the community. Epidemics of zymotic diseases originate from the refuse dump. Despite better knowledge and continuous warning from state and federal health authorities, even some of our largest cities continue to dump most of their refuse. While the dumping of garbage is generally considered dangerous, the erroneous belief prevails that dumping of rubbish and ashes is a safe, sane and satisfactory proceedure. Rubbish contains a large amount of putrescible matter subject to decay. Rats, flies and other vermin find the rubbish dump a welcome breeding place. The fact that children and also grown up people frequent these places, endeavoring to extract some valuable material, enhances the danger of the rubbish dump. Spontaneous combustion, causing dump fires which are hard to suppress, clearly proves the presence of disintegrating forces in the rubbish pile.

From an economic point of view, the dumping of rubbish must be condemned. It may be cheap in the first place, but will be exceedingly expensive to a town that may be visited by an epidemic of some virulent disease. Rubbish contains, besides an amount of salable material, an appreciable fuel value that can and should be salvaged. Furthermore, as the rubbish dump is generally located a considerable distance from the center of the community, the collection charges are high. A centrally located disposal plant can in some cases be operated for the difference in hauling cost, not to mention the returns derived from recovering the valuable constituents, especially the heat value.

Even the dumping of ashes is not without objection. Ashes commonly contain sufficient organic matter to cause a nuisance. This objection can be overcome by educating the householders to separate the waste carefully. However, ashes contain a considerable calorific value, depending on the nature of the predominating fuel used. Often as high as 35 per cent combustible matter is found in ashes. This represents a value worth while considering. It may in many cases be advantageous to recover this fuel value, especially as in such cases separate collections for the refuse may be dispensed with, thus simplifying and reducing the cost of handling. This fuel value may be used to reduce the cost of disposing of other waste matters.

Thus it is obvious that the practice of dumping refuse can only be recommended in some cases for ashes only. The dumping in water is no less offensive. The organic matter pollutes the water, lighter refuse parts float and contaminate the banks and beaches. Federal laws forbid this disposal in most cases.

RECLAIMING THE FOOD VALUE OF REFUSE.

Much has been written lately of the economic aspects in utilizing the food value to fatten hogs. This method can be used only in disposing of garbage. Rubbish and other refuse have to be separately handled and disposed of. Undisputedly, garbage contains a considerable food value. However, great obstacles must be overcome to exploit this value successfully. The method generally employed is feeding the green garbage to hogs without any other treatment save a superficial sorting of objectionable materials. As only about 30 per cent, never more than 50 per cent, of the garbage will be consumed by hogs, the remains from the feeding ground must be otherwise disposed of.

The fact that this method takes care of the disposal of one part of refuse only excludes its application in medium sized towns, even should a small revenue from this method be expected. These returns, often very problematic, will be fully offset by the necessity to provide means for the disposal of the other refuse, resulting in maintaining separate collection systems. In larger communities, where the amount of garbage is sufficiently large, hog feeding may be investigated, but always the relation of the possible revenue from this proceedure to the increase in cost of disposing of the other material must be considered. Also the sanitary conditions of this disposal means should be carefully weighed before deciding to employ this system.

One very important point to consider is the question of absolute reliability of this method. It takes a great number of hogs to devour the garbage of larger cities and, as the hogs eat in the most favorable cases only 50 per cent of the contents of the average city garbage pail, special provision must be made to dispose of the unconsumed portion. We have seen that this factor upset the satisfactory operation of a hog feeding scheme in one of our large cities. The feeder was forced to change the location of the hog farm three times in less than two years. Plowing under the residues from the feed pens will not help much. Untreated garbage has a very questionable value as fertilizer, especially if used freely. An epidemic among the hogs may paralyze the disposal for a considerable time. Therefore, provision shall be made to divert some or all of the garbage to some other disposal means during such periods. An incineration plant for the disposal of rubbish and other waste will be the most practical means to take care of such emergencies. If necessary, ashes, street sweepings and other less offensive refuse may be diverted from the incineration plant during such periods and disposed of by dumping or otherwise. It is well to consider such condition when deciding on the incinerator installation and to provide for a larger capacity of furnaces. This will be good practice

in any event, as a spare unit will materially help to safeguard operation and the additional cost for larger furnace capacity will be comparatively small.

In some instances garbage is cooked or otherwise treated before feeding to hogs or cattle. This procedure has not found great favor. It is claimed that the milk from cows fed with swill or garbage has an offensive taste and is of poor quality. Then the large congregation of stock or hogs necessary to dispose of the quantities, and the long hauls and repeated handling of this putrescible material, are obvious obstacles.

Reports from success of this method must be carefully weighed. In some instances where a high grade of garbage, such as produced in hotels or restaurants, or where the separation of garbage into various grades is done (as in some of the government military camps), feeding of garbage may be in place. However, the serious sanitary objections and the necessity to provide separate collections and disposal systems for the remaining refuse matter favor in very few instances the adoption of feeding garbage directly to animals.

Various attempts have been made to produce an animal food (cattle, hog and poultry) by drying, pressing or other mechanical means. However, so far we have not found any commendable process. Generally the variable nature of the garbage as well as the presence of undesirable material, such as tin cans, glass, crockery, etc., in the garbage can, raise the cost of intended treatment beyond the estimate.

VALUE AND UTILIZATION OF REFUSE AS FERTILIZER.

The basic idea of returning to the soil the organic matter taken from it suggests the utilization of fertilizing value of refuse. Every kind of municipal refuse contains some fertilizing value. However, in the state as collected, most of the waste can not be used directly as fertilizer without some mechanical or chemical transformation. Night soil (where separately collected) and manure are very valuable fertilizer in their natural state and every effort should be made to utilize them. We have encountered cases in small towns in purely agricultural districts of dumping into rivers or cremating as much as 15 tons of night soil per day. This must be considered a grave waste of valuable material. As night soil is separately collected only in communities having only partial or no sanitary sewer system, in rural districts all efforts should be bent to utilize this valuable fertilizer.

Sludge from sewage disposal works, especially the sediment of Imhoff or other bacteriological tanks, is not a very desirable fertilizer in its original state. Lime or other alkali should be added to prevent souring of the ground. Furthermore, sludge in semi-liquid state is difficult to transport without creating a nuisance. Such material must therefore be transformed into a more convenient form, preferably into a dry state, either through pressing or drying. This process, however, is rather costly and will practically annul the financial return from the sale of the finished product. The heat value contained in the sewage sludge promises a better and more commendable factor to exploit.

The fertilizing value of garbage is largely overestimated. Covered with ground, garbage is very slowly assimilated by the soil. If green garbage is to be used as fertilizer, it is preferable from a sanitary point of view, as well as from a utilitarian standpoint, to spread it over the ground in thin layers, permitting a more rapid decomposition under the influence of light and air, stimulating the propagation of bacterial life. The vapors arising by this procedure are far less objectionable than the gases emitted from fields in which the garbage is plowed under. Soil assimilates only a comparatively small amount of garbage without souring and, furthermore, soil treated with garbage must be allowed to oxidize thoroughly before it is in condition for planting.

Garbage, however, can be transformed into a very desirable fertilizer. Garbage and other refuse, such as rubbish and street sweepings, may be finely pulverized. The product of this process, called "poudro" or "poudrette," changes readily into a simpler form, easily absorbed by the earth, especially as it is possible to mix without difficulty products desirable to increase the fertilizer value. This process has been largely used in continental Europe, especially France, but with the development of the incinerator this method became almost extinct.

After extracting greases and oils through a reduction process, the residue, so-called tankage, forms a very desirable fertilizer. This is the most commendable process to exploit the fertilizing value of garbage.

The utilization of the fertilizing value of refuse is rather limited and demands two or more means to dispose of the waste matter, a fact which is of the most importance. Separate collections for the various classes of waste increase the relative cost of collection, demanding attention in estimating the economic side of the problem.

(To be continued)

Motor Convoy from Washington to Los Angeles

Plans have been completed whereby the War Department will send a motor convoy from Washington to Los Angeles over the Bankhead National Highway on or about June fifteenth, due to arrive at Los Angeles September first.

The convoy will be under the supervision of the Motor Transport Corps and will consist of a motor transport unit complete, at war strength, one service park unit, at war strength, detachment from Engineer Corps, and detachment from Medical Corps. All motor trucks will be one and one-half tons capacity equipped with pneumatic tires. They will pass through Virginia, North and South Carolina, Georgia, Alabama, Mississippi, Tennessee, Arkansas, Texas, New Mexico, Arizona and California, ending at Los Angeles.

The purpose of this and other overland trips will be to study the handicaps which surround the transportation needs of the army on account of the lack of dependable and definite systems of highways; to secure data relative to the use of various types of motor vehicles; to secure relative data on solid and pneumatic tires; to train officers and men in extended field operations and to recruit personnel for the various branches of the army.

The Federal Highway Council feels that such study by the Motor Transport Corps will be of great value to the entire country because it will thoroughly establish the necessity of the Federal Government undertaking the construction and maintenance of a definite System of National Highways.

Adapting Highways to Heavy Trucking

T. H. MacDonald, chief of the United States Bureau of Public Roads, states that our whole national road system must be rebuilt with the heavy truck especially in mind. The first thing to be done is to make a traffic survey of the roads of the country, determining just what traffic goes over each class of road, and fixing standards of construction for each class. It is generally agreed that a trunk system of paved roads is the only thing which, in the long run, will serve the purpose. Such roads will be expensive to build in the first place, but not nearly so expensive to keep up once they are built.

The Pennsylvania State Highway Department announces that the receipts of its automobile division up to May 4, 1920, were $6,127,865, showing an increase of $2,112,548 over the same period in 1919. These amounts are very comfortable sums for the encouragement of improved highway construction.

Engineering Platform for Presidential Candidates

The American Association of Engineers has addressed the following letter to the principal candidates for the United States presidency, namely: Major-General Leonard Wood, of Chicago; Senator Hiram Johnson, of California; Governor Frank O. Lowden, of Illinois; Herbert Hoover, of New York; Senator Warren G. Harding, of Ohio; Governor Henry J. Allen, of Kansas; Governor Calvin Coolidge, of Massachusetts; Honorable William Jennings Bryan, of Nebraska; Wm. G. McAdoo, of Washington, D. C.; Governor Jas. M. Cox, of Ohio, and Senator Atlee Pomerene, of Ohio:

Dear Sir:

At the sixth annual convention of the American Association of Engineers last week, a series of six questions was drafted, designed to bring out the position of candidates for President on subjects in which the engineer will be especially interested. A resolution was unanimously passed directing that these questions be sent to all candidates.

The American Association of Engineers is composed of 18,000 professional engineers rather evenly distributed over the country. They wish to help maintain our government on a high plane of efficiency.

If you will kindly answer the following questions at your early convenience, steps will be taken to acquaint our members and the public with your answers:

1—Are you in favor of a National Department of Public Works, for the purpose of reducing and coordinating the present number of bureaus and commissions, and reducing the useless expenditures of money incident thereto?

2—Are you in favor of assembling and coordinating all the engineering and construction enterprises of the government (excepting the purely military works) in a department such as the National Department of Public Works, to the end that economy and efficiency will be obtained?

3—Do you favor the appointment of an engineer of recognized ability and unimpeachable character as a member of the Interstate Commerce Commission?

4—Do you favor the budget system of appropriation of public funds?

5—Do you favor the reclamation of waste lands by drainage, irrigation, flood control or other methods?

6—Do you favor giving the settler the advantage of procuring the land by a sound financial system such as is provided by a rotating fund?

Cordially yours,
(Signed) C. E. DRAYER, Secretary.

Public Works Platform for State Candidates

The Charleston, West Virginia, Chapter of the American Association of Engineers has adopted a resolution requesting all candidates for public office in West Virginia to answer the following six questions:

"(1)—Are you in favor of the enactment of a law for the licensing of professional engineers, architects and land surveyors?

"(2)—Are you in favor of giving greater power to the state board of health, and enacting legislation to remove the present conflict in authority between the state board and local boards?

"(3)—Do you favor providing the state board of health with increased funds to carry out necessary work, such as is now done by all progressive states?

"(4)—Are you in favor of the state acquiring land and taking the lead in reforestation, thus stimulating private interests in the work of reclaiming denuded areas and adding to the wealth and resources of the state?

"(5)—Do you favor submitting to the voters a constitutional amendment permitting cities to issue bonds to at least ten per cent of their assessed valuation, for the purpose of acquiring and operating such self-supporting and income-bearing properties as water works, electrical plants and market places?

"(6)—Are you in favor of amending the constitution for the issuance by the state of $50,000,000 bonds for good roads?"

This chapter has requested the assistance of other engineering and architectural organizations in giving prominence to these questions as a means of developing a public appreciation of the necessity for engineering talent in state administration.

Highway Construction Threatened by R. R. Tieup

The great congestion of freight, the continued inefficiency of the railroads and the issuing of priority orders and embargoes have more and more stopped delivery of the materials for road building and have greatly delayed the highway construction schemes which ought to be in full progress in all parts of the country today.

The lack of materials and plant is not, however, the only drawback to highway construction; although the labor available for this purpose is not adequate, there is enough so engaged as to, in the view of railroad executives, seriously deplete the resources of man-power urgently needed for railroad operation and the advisability of the stoppage of all new highway building and a diversion of its labor to the railroad field in the present emergency is reported to be under discussion with some prospect of important action in the near future.

Maintaining County Highways

Information from counties in many of the states as to cost of maintaining their earth, gravel, concrete, brick, bituminous macadam and bituminous concrete highways, with mileage and traffic of each.

Among the questions submitted by us a few weeks ago to county highway engineers, the replies to most of which have already been published, were certain ones referring to maintenance of highways. The questions asked were the mileage of each kind of road surface in the county in 1919, its average width, the amount spent on it for maintenance during 1919, the average amount spent for each kind of surface per mile per year for a stated period of years, and the nature of travel over the road. This infromation we have assembled in a number of tables, one for each kind of road surface, which tables are presented herewith.

It is, of course, to be expected that the amount spent on maintenance would vary widely in the different counties, because of the great variation both in amount of travel carried and in climatic and other local conditions; also because of the different degrees of repair in which the county was satisfied to see its roads maintained.

It is, of course, quite common for a county to spend comparatively little on maintaining a given road for a year or two, making the necessary repairs at intervals of two or more years. In order to provide for this as far as possible in the maintenance cost figures, we asked our informants to report the average cost per mile per year for as long a period of years as their records would permit. In this way we obtained the averages of from three to ten years in a great many cases. Even these, however, show very wide variations. Concrete, for instance, varied from nothing to $324; brick from $5 to $270; gravel from $20 to $1,080.

In order to allow for the difference in individual

MAINTENANCE OF EARTH COUNTY HIGHWAYS.

State & County.	Miles in the county.	Average width, ft.	Amount spent in 1919.	Aver. amount per mile per year.	No. of of years averaged	Number and kind of vehicles using road per day—approximate.
Alabama:						
Mobile	1,500	20	.....	$30.00	5	Light
Arkansas:						
Polk	100	12	.....	3,000.00	..	Ordinary country travel
Florida:						
Bay	100	20	None	Just built	..	Very light
Illinois:						
Christian	17.3	24	$1,434.21	82.90	1	Heavy
De Witt	732	30	65,000.00	90.00	5	.....
		..	....	60.00	20	.....
McDonough	12	24	1,200.00	100.00	3	500 per day
Schuyler	860	..	55,000.00	....	..	.....
Indiana:						
Vigo	356	9	356.00	10.00	5	.....
Iowa:						
Appanoose	400	50	15,140.00	....	..	.....
Bremer	133	..	12,144.00	....	..	200
Clarke	118.63	24	19,182.76	84.13	7	300 vehicles, 2,500 lb. aver. wt.
Clay	73	26	2,175.58	30.00	3	.....
Clayton	206	24	109.05	92.50	5	200 vehicles, mostly autos
Clinton	192	24	26,024.00	62.00	5	.....
Decatur	9	26	625.00	....	1	.....
Hamilton	900	20	40.00	25.00	10	20 1½-ton
Harrison	168	60	14,600.00	33.00	6	300
Ida	..	26	29,123.16	103.41	4	300 2,000-lb. vehicles
Iowa	55	24	78.69	55.23	5	165
Keokuk	1,231	18–26	66,221.86	53.80	1	1-5,000 vehicles, 4-ton max., with a few 15-ton tractors
Lucas	155	24	10,671.00	8,000.00	5	125 per day—2 tons
Mills	110	28	500.00	175.00	5	Very heavy
Mitchell	120	26	100.00	75.00	5	About 200
Montgomery	928	..	....	35.00	1	Pleasure and heavy trucks, average weight 1½ ton
Muscatine	730.4	24	....	128.00	4	.....
O'Brien	1,125	36½	....	50.00	6	Auto & farm to town traffic
Pottawattomie	261	26	66,000.00	230.00	5	.....
Sac	110	..	100.00	50.00	3	Medium heavy
Scott	490	24	12,500.00	80.00	5	25 1-ton
Shelby	157.75	26	12,266.50	64.08	5	.....
Story	1,100	..	....	160.00	..	.....
Van Buren	133	36	15,000.00	....	....	200 varied
Kentucky:						
Graves	730	16	2,000.00	4.00	3	65
Henderson	567	20	24,710.96	45.00	..	.....
Michigan:						
Alger	60	16	....	186.11	1	100 touring cars per 24 hours
Luce	12	24	2,400.00	160.00	..	.....
Minnesota:						
Chippewa	120	20	107.58	....	..	.....
Chisago	115	20	12,150.00	8,200.00	4	50 teams, 100 cars
Clay	168	20	20,000.00	120.00	1	.....
Goodhue	94	..	140.00	....	..	.....
Grant	95	20	7,000.00	50.00	5	Autos and teams
Lyon	33.5	24	6,878.09	165.00	2	100 2-ton
Nicollet	560	20 to 24	5,950.00	161.00	1	.....
Steele	48	18	2,400.00	40.00	5	50-100 per day, light
Stevens	755	22	7,000.00	....	..	.....
Waseca	116	24	113.00	250.00	3	.....
Watonwan	97	24	90.00	90.00	3	50
Wilkin	.	..	7,000.00	57.00	1	50% teams, 50% autos, 2,500 [illegible]

MAINTENANCE OF EARTH COUNTY HIGHWAYS (Continued).

State & County.	Miles in the county.	Average width, ft.	Amount spent in 1919.	Aver. amount per mile per year.	No. of of years averaged	Number and kind of vehicles using road per day—approximate.
Mississippi:						
Jefferson	441	14-18	$48.00-56.00	$40.00	10	.....
Pearl River	800	20	45,000.00	52.00	5	10-15
Missouri:						
Camden	159	22	5,000.00	....	..	.....
Miller	1,000	20	35,000.00	35.00	4	.....
Mississippi	487	24	10,611.68	....	..	.....
Ozark	891	20	20,000.00	20.00	5	.....
Montana:						
Beaverhead	1,700	16	61,000.00	....	..	Heavy trucks & tourist travel
Carbon	9,000	20	20,000.00	....	..	Farm and tourist
Cascade	2,009	..	27,400.00	....	..	Cars, farm wagons, tractors
Chouteau	560	28	....	75.00	..	.....
Flathead	1,600	15	24,500.00	....	..	25 1-ton
Gallatin	1,050	20	75,856.49	40.00	10	1 to 250
Granite	330	14	15,500.00	....	..	.....
Hill	1,000	16	25,000.00	....	..	.....
Madison	1,300	14	50,000.00	....	..	.....
Meagher	158	20	513.50	4.25	3	50 vehicles, light cars, 3-ton trucks, horse-drawn vehicles, heavy tractors
New Jersey:					..	Light farm
Mercer	3.5	..	642.00	....		
North Carolina:						
Beaufort	1,400	20	....	57.00	1	.....
North Dakota:						
Barnes	3,000	20	....	25.00	..	.....
Ohio:						
Hancock	320.9	10	150.00	....	..	.....
Highland	564.6	30	7,000.00	10.00	5	.....
Oklahoma:						
Alfalfa	213	30	117.37	117.37	..	.....
Choctaw	85	18	27,000.00	....	..	.....
Kiowa	210	24	73.00	....	..	.....
Oregon:						
Multnomah	138	..	....	100.00	..	.....
South Carolina:						
Greenwood	2,200	22	55,000.00	25.00	3	300 2-horse wagons, 1,500 fos., 100 pleasure cars
South Dakota:					..	350 vehicles, 4% trucks
Beadle	78	20	9,957.70	....		
Custer	43	20	4,000.00	....	..	.....
Edmunds	99	40	3,500.00	....	..	.....
Gregory	220	20	15,000.00	Negligible	..	.....
Meade	200	..	3,000.00	....	..	.....
Utah:						
Uintah, Duchesne, Carbon, Emery, Grand & San Juan.	750	18	30,000.00	....	..	Heavy tourist and freighting by teams and trucks
Virginia:						
Wise	120	18	12,000.00	....	..	.....
Washington:						
Kittitas	554	24	45,400.00	....	..	.....
West Virginia:						
Monongalia	1,000	12	....	100.00	..	.....
Morgan	200	16	25,000.00	....	..	100 daily—1½ tons average
Nicholas	16.5	24	1,200.00	70.66	3	90% horse drawn, 100 per day
Wisconsin:						
Brown	900	24	10,000.00	....	..	250 cars
Forest	107	33	....	175.00	..	Very few trucks
Richland	134	..	18,000.00	....	..	.....

MAINTENANCE OF GRAVEL COUNTY HIGHWAYS.

State and County.	Miles in the county in 1919.	Average width feet.	Amount spent in 1919.	Average amount per mi. per yr.	Number of years averaged	Number and kind of vehicles per day—approximate.
Alabama:						
Calhoun	23	12	$230	$10	3	Light county travel
Etowah*	100	12	10,000	10	4	200 wagons and cars
Arkansas:						
Sevier	25	14	3,000	12	4	150 autos, 40 10-ton trucks.
California:						
Plumas	150	10	25,000	..	..	Motor vehicles, 9 mos., snow-bound 3.
Illinois:						
Carroll	15	12	2,000	..	..	.....
Fulton	70	16	....	50	5	Light.
Lawrence	130	9	....	500	1 to 6	100 to 600, all wghts. up to 10 tons
Logan	36	20	1,134†	32	2	.....
Schuyler	2	14	600	300	..	.....
Wabash	100	9	20,000	..	..	.....
Warren	15	15	....	50	12	Heavy
Indiana:						
Delaware	568.5	..	40,800	..	..	.....
Henry	371	..	62,696	133.35	3	Up to 280 trucks & touring cars
Jennings	20	10	1,000	10	..	.....
Vigo	415	9	415	20	5	250, 1 to 7-ton
Iowa:						
Cerro Gordo	7	16	200	1,080	3	400
Clay	75	14	4,761	75	3	100 local to 900 motor cars
Clinton	14	12	1,892	120	3	400 farm and interurban
Dickinson	70	20	20,000	300	..	2,000 autos
Emmet	38.5	9	18,968‡	85.92	1	500, average weight 2,500 lbs.
Grecne	50	8	12,981	..	..	.....
Hamilton	74	15	200	150	4	50 1½-ton
Humboldt	45	12	2,500	65	5	.....
Mitchell	15	..	....	300	5	300
Palo Alto	2.83	..	....	70	4	250, mostly motor
Sac	40	12	10,000	200	3	Medium heavy
Scott	20	12	3,000	100	5	300, 1½-ton
Kentucky:						
Rockcastle	4	9	50	..	..	40 one-ton

MAINTENANCE OF GRAVEL COUNTY HIGHWAYS (Continued).

State and County.	Miles in the county in 1919.	Average width feet.	Amount spent in 1919.	Average amount per mi. per yr.	Number of years averaged	Number and kind of vehicles per day—approximate.
Louisiana:						
10th Ward, Avoyelles	4	14	1,000	250	4	.....
Maine:						
Penobscot	15	14	....	60	4	40, average weight 2,800 lbs.
Michigan:						
Cass	93	9	12,436	143§	5	100, 80 3-ton motors
Eaton	225	9 & 12 to 16	40,000	100	5	.....
Luce	11	16	3,300	90	..	.....
Marquette	27.8	15	10,315	..	..	.....
Mecosta	105	12	15,000	130	2	250, 10% horse drawn
Muskegon	50	12	25,000	350**	5	300 mixed
Schoolcraft	5	9	500	100	3	.....
Minnesota:						
Aitkin	6	20	16,000	40	8	.....
Brown	71	8	13,368	..	..	Light—few trucks
Carlton	91	18	10,000	50††	5	300 autos
Chippewa	16	24	1,721	..	..	.....
Chisago	30	20	10,000	312	4	200 cars
Crow Wing	25	18	5,100	125	4	200 to 600 cars
Dodge	16	15	1,872	125	5	Not very heavy
Goodhue	64	18	180	..	..	200 autos, 4 trucks, 14 others
Grant	10	24	3,000	200	5	Autos and teams
Jackson	6	18	5,700	430	3	356 autos, 16 trucks, 88 teams
Kanabec	12	16	....	67	..	.....
Kandiyohi	15	20	3,100	430	5	600, mostly cars
Lyon	122	24	16,502	235	2	250 1½-ton
Marshall	22	24	....	55	3	.....
Nicollet	250	20 to 24	22,050	225	1	200, 75% touring cars, 5% trucks
Sibley	178	18	17,000	100	1	.....
Stearns	30	16	100	90	5	Autos and teams
Steele	64	18	12,500	150	5	200 to 800
Waseca	16	20	3,200	200	1	300
Watonwan	12	24	2,400	200	2	100
Missouri:						
Callaway	23	9	2,500	30	4	300, average 2 tons
Lincoln	30	9	15,500	210	6	85
Polk	50	9	1,000	25	5	100 2-ton
Montana:						
Granite	20	14	500	..	..	Up to 100
New Jersey:						
Burlington	60	16	....	300§§	..	Heavy
Hunterdon	10	16	2,000	..	..	.....
North Dakota:						
Barnes	42	20	2,000	..	..	300
Ohio:						
Ashland	15	12	3,000	..	..	Autos
Champaign	666	10	60,000§	20	10	.....
Coshocton	64	16	6,406	..	..	.....
Fulton	346	12	6,920	20	..	2 to 8-ton milk trucks
Hancock	95.5	10	500	..	..	.....
Highland	303.9	12	30,000‡	60	5	.....
Madison	415	15	60,000	100	4	Team and auto trucks
Putnam	61	9	9,500	175	..	.....
Shelby	400	14	20,000	40	8	20 2-ton
Tuscarawas	60	20	10,000	..	..	100 touring cars
Tennesse:						
Gills	350	12	124,000	..	..	.....
Vermont:						
Bennington	100	20	204	..	..	1,500 autos
Virginia:						
Fairfax	40	16	6,000	..	..	20 miles heavy, balance moderate
Henrico	120	20	5,400	40	3	Wagons
Washington:						
Clellan	77	22	40,000‡	430	2	Touring cars and heavy trucks
Lincoln	114	18	19,000‡	200	5	90% motor
Pend Oreille	43	20	8,018	150	3	25 to 100 autos and vehicles
West Virginia:						
Summers	20	12	4,000	50	12	100
Wisconsin:						
Adams	2	9	20	10	2	.....
Brown	100	9	25,000	..	..	500 cars
Polk	100	9½	39,000	112	1	250
Richland	4	9	400	..	..	.....
Rock	300	9	40,250	130	3	.....
Trempealeau	15	10	....	65	5	Heavy

Note: Unless otherwise stated, maintenance costs given include only labor and materials. *Gravel and chert combined. †Labor only—own gravel pits. ‡Includes equipment. §Supervision and tools. **Upkeep and depreciation on equipment. ††Includes engineering and supervision. §§Some overhead and some equipment.

MAINTENANCE OF BITUMINOUS CONCRETE COUNTY HIGHWAYS.

State and County.	Miles in the county in 1919.	Average width, feet.	Amount spent in 1919.	Average amount per mile per year.	Number of years averaged.	Number and kind of vehicles using road per day.
New Jersey:						
Mercer	17	18	$995	....	....	Very heavy trucking.
Passaic	41.9	24 to 20	10,690*	$25*	2	.....
New York:						
Erie	6.9	16	183†	....	....	.....
Otsego	1.0	16	....	150	2	25 per cent. trucks.
Oneida	17.2	20	4,776	349	3	1,945 1¾-ton.
Schenectady	0.4	20	Nothing.	....	....	700 2-ton.
Ohio:						
Clark	9.4	16	Nothing.	....	....	.....
Muskingum	1.0	14	602	575	....	.....
Virginia:						
Fairfax	5	12	500	....	....	Heavy traffic.
Washington:						
King	14.4	16	....	1,200	2	1,500 to 2,000.

*$10,000 spent last year on one 3-mile section. †Per mile.

MAINTENANCE OF BITUMINOUS MACADAM COUNTY HIGHWAYS.

State and County.	Miles in the county in 1919.	Average width, feet.	Amount spent in 1919.	Average amount per mile per year.	Number of years averaged.	Number and kind of vehicles using road per day—approximate.
Illinois:						
Madison	5	15	....	$600	6	.....
Indiana:						
Delaware	23	....	$9,000	....	....	.....
Vigo	29	9	....	200	3	1,000, 1 to 10-ton.
Michigan:						
Gogebic	1.5	16	....	900	1	.....
Marquette	12.7	15	4,894	....	....	.....
New Jersey:						
Hunterdon	10	16	2,000	....	....	.....
Mercer	13	18	562	....	....	Medium truck and pleasure traffic.
Passaic	5.9	20 to 30	8,049	1,365	2	.....
New York:						
Cattaraugus	18	16	474*	....	....	.....
Chautauqua	7.7	16	565*	....	....	.....
Erie	51.4	16	680*	....	....	.....
Niagara	36.7	16	714*	....	....	.....
Lewis	46.7	14	5,800	160	2	242 autos, 20 trucks, 25 1-horse, 23 2-horse.
Oneida	100.6	16	35,770	507	3	1,007 1½-ton.
Schenectady	30.6	16	13,739	....	....	600 3½-ton.
Ohio:						
Ashland	12.2	10	3,000	....	....	.....
Clark	6.5	16	6,000	....	....	.....
Fulton	78.6	16	39,290	500	....	.....
Highland	24.7	16	30,000	1,000	5	.....
Muskingum	3.9	16	4,232	1,075	1	.....
Preble	26.7	16	28,560	1,200	5	.....
Richland	60	14 to 16	50,000	....	....	.....
Shelby	12	16	5,000	500	2	40 5-ton vehicles.
Summit	4.2	16	2,604	940	1	.....
Tuscarawas	9.1	16	6,800	....	....	150 touring cars.
Virginia:						
Augusta	30	14	6,000	200	4	.....
Henrico	14	16	1,400	200	3	Heavy trucks.
Pittsylvania	5	20	200*	....	....	.....
Wise	20	9	8,000	....	....	250, all kinds.
West Virginia:						
Mineral	8	14	1,200	....	....	.....

*Per mile.

MAINTENANCE OF CEMENT CONCRETE COUNTY HIGHWAYS.

State and County.	Miles in the county in 1919.	Average width, feet.	Amount spent in 1919.	Average amount per mile per year.	Number of years averaged.	Number and kind of vehicles using road per day.
Alabama:						
Mobile	1	30	....	$100	5	Heavy.
Illinois						
Carroll	2	10	$200	....	....	.....
Douglas	2.1	16	Nothing.	15	5	.....
Fulton	5.0	16	....	5	5	Heavy.
Lawrence	5.5	10	....	100	4	200 to 600.
Madison	32.5	15	850	28	6	.....
Monroe	1.2	10	Nothing.	....	....	200
Stephenson	1.5	15	70	....	....	200
Indiana:						
Delaware	3	18	Nothing.	....	....	.....
Vigo	3	20	3	75	2	1,000, 1 to 10 tons.
Iowa:						
Cerro Gordo	8	16	28.30	31.80	6	650
Maryland:						
Kent	10	14	150	75	4	.....
Michigan:						
Muskegon	2.5	18	75*	40	3	1,200 motor.
New Jersey:						
Burlington	10	18	Nothing.	....	....	Heavy.
Mercer	2	18	244†	....	....	.....
Passaic	4.4	30 to 20	....	None.	2	.....
New York:						
Cattaraugus	30.2	16	203§	....	....	.....
Chautauqua	25.3	16	240§	....	....	.....
Erie	36.9	16	84§	....	....	.....
Lewis	8.8	12	500	80	....	Autos, 242; trucks, 20; horse, 48.
Niagara	49.7	16	222§	....	....	.....
Oneida	5.5	16	50	128	3	401 1½-ton.
Otsego	15	16	....	230	4	.....
Schenectady	10.5	16	500	....	....	100 2⅔-ton.
Ohio:						
Ashland	0.5	16	Nothing.	Nothing.	3	Motor cars.
Champaign	2.5	14	200	75	5	.....
Clark	15.7	16	15,000	....	....	.....
Coshocton	2.1	16	....	100	....	.....
Holmes	1.6	12	800	....	....	.....
Huron	96.3	10 to 16	1,934	30	3	Ordinary farm to heavy trucks.
Madison	3.1	18	100	30	4	Trucks, autos & teams.
Muskingum	12.4	16	4,000	324	1	Very heavy.
Putnam	0.6	16	Nothing.	....	....	.....
Richland	9	10 & 14	None.	....	....	.....
Shelby	1	16	100	50	2	40 5-ton.
Summit	2.4	17	1,274	5.30	1	.....
Virginia:						
Fairfax	8	18	600	....	....	Very heavy.
Halifax	2	16	Nothing.	....	....	.....
Washington:						
King	36.7	19	....	1,600*	2	1,500 to 2,000
Lewis	28	8, 16, 18	....	19.49	7	.....

MAINTENANCE OF CEMENT CONCRETE COUNTY HIGHWAYS (Continued).

State and County.	Miles in the county in 1919.	Average width, feet.	Amount spent in 1919.	Average amount per mile per year.	Number of years averaged.	Number and kind of vehicles using road per day.
West Virginia:						
Mineral	2.2	15	200	....	....	.....
Monongalia	8	16	80	10	1	100
Pleasants	5	14	300	12	5	Light farm, few heavy trucks.
Putnam	1	9	Nothing.	....	....	100 1.7 tons.
Ritchie	12	9	400	....	....	100 heavy teams and trucks.
Summers	6	14	100	10	5	Heavy.
Wisconsin:						
Richland	2.7	16	200	....	....	.....

*Includes upkeep and depreciation on equipment. †Includes administration and truck maintenance. §Per mile.

MAINTENANCE OF BRICK COUNTY HIGHWAYS.

State and County.	Miles in the county in 1919.	Average width, feet.	Amount spent in 1919.	Average amount per mile per year.	Number of years averaged.	Number and kind of vehicles using road per day.
Florida:						
Hillsborough	65	15	....	$28.05	....	.....
Illinois:						
Douglas	13	10	None.	10	5	.....
Fulton	12	16	....	5	12	Heavy.
Lawrence	1	15	....	100	3	600
Stephenson	2	16	50	....	....	200
Warren	9	10	....	20	10	.....
Indiana:						
Delaware	15.5	....	200	....	....	.....
Vigo	13	20	13	150	5	§1,500 1 to 15 tons.
New York:						
Cattaraugus	4.6	16	Nothing.	77	3	.....
Chautauqua	33.1	16	298*	260	3	.....
Erie	114.0	16	366*	270	4	.....
Niagara	26.6	16	297*	254	3	.....
Oneida	1.5	28½	95	108	3	733 1½-ton.
Otsego	0.8	16	Nothing.†	....	....	.....
Schenectady	3.5	18	Nothing.	....	....	.....
Ohio:						
Ashland	27.2	10	2,500	....	....	Motor cars.
Carroll	6	16	700	100	3	.....
Coshocton	6	16	....	100	....	.....
Hancock	18.5	16	500	....	....	.....
Holmes	4.8	10	4,700	....	....	.....
Huron	22	....	....	3	2	Heavy.
Jefferson	8	....	2,000	....	....	.....
Muskingum	21.6	16	10,069	467	1	Very heavy.
Richland	7	10 & 14	Nothing.	....	....	.....
Summit	58.1	15	74,429	2,190	1	47 5-ton, 34 3-ton, 77 1½-ton, 10 over 5 tons, 3,039 passenger cars, 63 horse.
Tuscarawas	30.4	16	3,000	....	....	20 trucks, 200 touring cars.
West Virginia:						
Monongolia	6	16	70	7	3	100 ½ to 10 tons.
Summers	4	20	400	100	5	Heavy.
Washington:						
King	44	18	....	2,000	2	1,500 to 2,000.

*Per mile. †Some needed, however.

ideas as to what constitutes maintenance, the only practicable plan appears to be to make comparisons between costs in individual counties. This could be carried out to only a limited degree, however, because comparatively few counties have more than two or at most three kinds of surfaces on which to report. Taking those reporting on three or more kinds or surface, we find the following figures reported:

Mobile Co., Ala.—Sand-clay $30, earth $30, concrete $100.

Fulton Co., Ill.—Concrete $5, brick $5, sand-clay $25, gravel $50.

Lawrence Co., Ill.—Concrete $100, brick $100, gravel $500.

Vigo Co., Ind.—Earth $10, gravel $20, concrete $75, brick $150, bituminous macadam $200.

Passaic Co., N. J.—Concrete 0, bituminous concrete $25, bituminous macadam $1,365.

Oneida Co., N. Y.—Brick $108, concrete $128, bituminous concrete $349, bituminous macadam $507.

Highland Co., Ohio—Earth $10, gravel $60, bituminous macadam $1,000.

Shelby Co., Ohio—Gravel $40, concrete $50, bituminous macadam $500.

Monongalia Co., W. Va.—Earth $100, concrete $10, brick $7.

Summers Co., W. Va.—Gravel $50, concrete $10, brick $100.

Averaging the reports from all the counties for an average cost per mile per year, including only those where more than one year was reported on, the maintenance costs were found to be as follows, the average cost and the average number of years being given in each case:

Sand-clay—$48, six years.

Dirt—$76, five and a quarter years.

Cement concrete—$128, four years.

Gravel—$153, four and a half years.

Brick—$231, four and a half years.

Bituminous concrete—$431, two and a quarter years.

Bituminous macadam—$493, three and a half years.

One point which attracts notice in this statement is the small number of years for which maintenance costs could be given in the case of pavements which have been in use for many times this number of

MAINTENANCE OF SAND-CLAY COUNTY ROADS.

State and County.	Miles in the the county in 1919.	Average width, feet.	Amount spent in 1919.	Average amount per mile per year.	Number of years averaged.	Number and kind of vehicles using road per day.
Alabama:						
Mobile	500	20	....	$30	5	Medium
Florida:						
Bay	15	16	None	....	....	200, 2500 lb
Sumter	50	12	7,000	....	....	50
Illinois:						
Fulton	80	24	....	25	8	Heavy
Marion	8	24	1,200	75	3	.....
Iowa:						
Iowa	8	24	36.88*	27.64	5	180
Plymouth	1,500	20	26,840	....	....	.....
Maryland:						
Kent	425	33	63.33	50	10	.....
Michigan:						
Luce	1	....	100	....	....	.....
Marquette	60.3	15	20,898	....	....	.....
Minnesota:						
Crow Wing	40	18	5,900	100	....	200 to 500, 1½-ton
Hubbard	128	20	5,888	....	....	400
Kanabec	81	20	....	73	....	.....
Missouri:						
Polk	5	14	200	25	10	.....
Washington	80	....	48.70	....	....	.....
Montana:						
Musselshell	1,798	26	35,478	....	....	.....
Phillips	450	16	10,000	20	1	75 1-ton wagons, 15 1½-ton trucks, 35 autos.
Sanders	608	16				
Stillwater	1,100	60	300	....	....	.....
Nebraska:			35,000	....	....	.....
Knox	250	28	10,000†	....	....	.....
North Carolina:						
Person	50	26	10,000	....	....	.....
Wilson	80	....	80*	50	2	.....
Ohio:						
Fulton	376.7	....	7,520	....	....	.....
Tuscarawas	1,188.6	20	15,000	....	....	.....
Oklahoma:						
Potawatomie	127	24	12,000	100	4	Little heavy trucking
West Virginia:						
Summers	200	12	5,000	....	....	Light
Wisconsin:						
Juneau	100	12	18,406	....	....	160 1½-ton
Richland	2	14	400	....	....	.....

*Per mile. †Includes machinery.

years. For instance, brick figures were given for an average of only four and a half years, whereas brick pavements have been in use for thirty years in some cities and for ten or fifteen years in a great many cities. Also bituminous macadam figures average only three and a half years and bituminous concrete only two and a quarter years, although hundreds of miles of these kinds of pavement have been in use for ten years and more. The reason for this is undoubtedly that already referred to—that few counties have kept maintenance costs in any detail until within the past three or four years, some are just inaugurating a system of accounts of this kind, and a few of the more backward ones have not yet even reached this point.

One point brought out in the general tables is the considerable number of county officials who are able to give figures, at least approximate, concerning the amount of traffic on roads in their counties. Although a number of the figures given are probably estimates and some may be little more than guesses, it is apparent from the details given in other cases that regular traffic counts have been made.

All of which goes to demonstrate that the science of road construction and maintenance is in its infancy, since a science can be built up only by an accumulation and analysis of known facts, the reliability of the laws deduced increasing with the number of coordinated facts accessible for study; and, up to the present, the facts concerning the behavior of highway materials under various conditions, and even the itemized costs of constructing and maintaining highways of different known characteristics, are deplorably meager.

$2,000,000,000 Strike Loss

F. H. Sisson, vice-president of the Guaranty Trust Company, is authority for the statement that in 1919 the loss from strikes in the United States amounted to $2,000,000,000, including $750,000,000 loss of wages to employes. Mr. Sisson blames strikes for high living costs and increased rents, the latter being due to the fact that organized labor ignores the fact that every time building trades employes strike or shirk their work they increase the cost of building, thus increasing the rents and making higher prices for goods and services of all kinds.

General Wood Favors Selected Immigrants

General Leonard Wood is quoted as saying, "We must give more care to our immigration. We need a certain amount of immigration, but we have a right to know something of the quality of the people who come here. It is not enough that they should be physically sound and of reasonable mental intelligence, but we have a right to know whether they come from the anarchistic group whose religion is destruction and whose object is the ruin of all governments. We do not want this class to come into this country. When these people arrive, I think we ought to hold them for a time under observation. We are glad to welcome the immigrants who come here to adopt our institutions and live up to our standards and ideals. But we should turn our faces against classes of people who are coming here with avowed dislike to our institutions and with declared intention of pulling down our government."

Recent Legal Decisions

CONTRACTS.

CONSTRUCTION AND OPERATION.

The circumstances under which a contract is made, or the intent of the parties existing at the time, are only material when the contract is ambiguous in some of its terms.

(Okl.) However broad may be the terms of a contract, it extends only to those things concerning which it appears that the parties intended to contract.—Wolf v. Blackwell Oil & Gas Co., 186 P. 484.

(Okl.) Under Rev. Laws 1910, c. 12, art. 3, the language of a contract is to govern its interpretation if such language is clear and explicit and does not involve an absurdity.—Wolf v. Blackwell Oil & Gas Co., 186 P. 484.

Under Rev. Laws 1910, c. 12, art. 3, the whole of a contract is to be taken together so as to give effect to every part, if reasonably practicable, each clause helping to interpret the others, and the words to be understood in their ordinary and popular sense unless used by the parties in a technical sense.—Id.

(Mont.) If, upon a reasonable construction, contracts may be upheld, the courts will uphold them.—Helena Light & Ry. Co. v. Northern Pac. Ry. Co., 186 P. 702.

(Or.) Written contracts should be construed from the standpoint of the parties when they were contracting, and be so interpreted as to give effect to all the provisions, if possible.—Dolph v. Speckart, 186 P. 32.

(Vt.) While courts have construed "or" for "and," and vice versa, where such construction was necessary to carry out the manifest intention of the parties, such construction has never been resorted to for the purpose of supplying an intention not otherwise appearing.—Rice v. Bennington County Sav. Bank, 108 A. 708.

(U. S. C. C. A., Okl.) Where the intentions of the parties are clearly ascertainable from the contract and their mutual actions under it, inconsistent expressions in it must be disregarded.—American Refining Co. v. Bartman, 261 F. 661.

(Tex. Civ. App.) Apparent conflicting clauses must be reconciled by a reasonable interpretation, and in case of variance the one which contributes most essentially to the contract is entitled to the most consideration.—Price v. Biggs, 217 S. W. 236.

(Mo.) Where contracts stated that, in case of dispute or "litigation to enforce any of the provisions of this contract. * * * then the notes herein mentioned and this contract shall be construed and interpreted and given force and effect of and by virtue of the existing laws of the state of Texas as interpreted by the courts of said state," the laws and their construction by the Texas courts were as much in the contract as if fully written therein.—Fidelity Loan Securities Co. v. Moore, 217 S. W. 286.

(Tex. Civ. App). A subcontractor is presumed to undertake his work subject to conditions and limitations in the contract between the principal contractor and the owner, if he knows these conditions and limitations; the presumption being conclusive if latter contract is made a part of the former contract.—Hartwell v. Fridner, 217 S. W. 231.

(N. Y. Sup.) Terms implied by legal presumption need not be expressly stated.—Swedish-American Nat. Bank v. Merz, 179 N. Y. S. 600.

(Mont.) The circumstances under which a contract is made are only material when the contract is ambiguous in some of its terms.—Helena Light & Ry. Co. v. Northern Pac. Ry. Co., 186 P. 702.

(Tex. Civ. App.) It is always permissible to show what the parties did under their contract, as disclosing their construction of its purpose.—Eddleman v. Wofford, 217 S. W. 221.

(N. C.) Where a contract is entirely written and intent of the parties is to be collected from the document itself, the construction of the contract is a question of law, and the jury should pass only on the existence of the agreement.—Patton v. Sinclaire Lumber Co., 101 S. E. 613.

(S. C.) Where a written contract was not produced at the trial and the evidence conflicted as to its terms, the effect of the contract presented a jury question.—Allen v. Orr, 101 S. E. 817.

(S. C.) Whether or not there is a contract is ordinarily a question of fact for the jury, but, when the undisputed facts do not make a contract, it becomes a question of law and not of fact.—Capital City Garage & Tire Co. v. Electric Storage Battery Co., 101 S. E. 838.

(Utah) Where the terms of a written contract sued upon are neither ambiguous nor uncertain, it is the duty of the court to construe the contract and to advise the jury of the respective rights of the parties thereunder.—Armstrong v. Larsen, 186 P 97.

CONDITIONS.

(Cal.) The conditions of a written contract may be orally waived.—Walker v. Harbor Business Blocks Co., 186 P. 356.

RESCISSION AND ABANDONMENT.

(Cal.) Where a stipulation does not go to the root of a contract, so that failure to perform would render the rest of the contract different in substance, there is not ordinarily such a breach as will authorize abandonment by the other party, nor is there a fatal breach, where nonperformance of one of the conditions does not materially impair the contract, and may be compensated in damages.—Walker v. Harbor Business Blocks Co., 186 P. 356.

(N. Y. Sup.) To entitle party to rescission of a contract, he must restore what he has received and place the other party in statu quo.—O'Rourke Engineering Const. Co. v. Booth & Flinn, 179 N. Y. S. 623.

(Wash.) A party cannot rescind a contract without offering to put the other party in status quo.—Normile v. Denison, 186 P. 305.

NEWS OF THE SOCIETIES

June 3-4.—NATIONAL STATE AND LOCAL ENGINEERING SOCIETIES. Organizing conference will be held at Washington, D. C.

June 16-18.—NORTH CAROLINA GOOD ROADS ASSOCIATION. Annual convention, Asheville, N. C.

June 19-21.—TRI-STATE WATER AND LIGHT ASSOCIATION. Tenth annual convention, Atlanta, Ga. Secretary-treasurer, W. F. Steiglitz, Columbia, S. C.

June 21-25.—AMERICAN WATER WORKS ASSOCIATION. Annual meeting, Montreal, Canada. Secretary, John M. Diven, 153 West 71st Street, New York City.

June 22-25.—AMERICAN SOCIETY FOR TESTING MATERIALS. Asbury Park, N. J. Office of secretary, Philadelphia.

June 22.—JOINT COMMITTEE ON STANDARD SPECIFICATIONS FOR CONCRETE AND REINFORCED CONCRETE. Next meeting at Asbury Park. Secretary-Treasurer, D. A. Abrams, Lewis Institute, Chicago.

July 26-30.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Toronto, Canada. Secretary, Stephen E. Hoey, Municipal Building, New York.

Aug. 30-Sept. 3.—AMERICAN PUBLIC HEALTH ASSOCIATION. San Francisco. Office of secretary, Boston.

Sept. 13-17.—AMERICAN PUBLIC HEALTH ASSOCIATION. Boston, Massachusetts.

Oct. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 401 Lincoln Avenue, Valparaiso, Ind.

New Jersey State Association of County Engineers.

The N. J. State Association of County Engineers recently visited the experimental farm of the Department of Agriculture at Washington, D. C., and inspected the series of field tests being conducted there by the Department of Public Roads. The tests covering "pavement wear sections" were particularly interesting as a device resembling heavy steel-bound traffic was being drawn over sections of pavement laid under various conditions and construction. These results are vastly important to all highway engineers. Another portion of the experiment covered "field impact tests on slabs." Artificial truck impact was being applied to various pavements built in small slabs under various conditions of drainage.

Through the kindness of A. T. Goldbeck, engineer in charge of tests, F. H. Jackson, Jr., assistant engineer of tests, and E. P. Smith, assistant engineer in charge at Arlington, the association spent a very profitable time inspecting the tests being conducted by the Department. The Association feels that the U. S. Governent should allot and provide all the necessary moneys to carry on these vital experiments, because at this time great quantities of money are being appropriated for highway work and it is only by work such as is being done by the men mentioned above that valuable data will be obtained.

American Association of Engineers.

The outstanding sentiment of the delegates and other members attending the sixth annual convention of the American Association of Engineers in St. Louis was a desire for building up strong chapters of the association and for decentralization of some of the business functions.

The chapters are anxious to take over some of the work that has been formerly done at national headquarters, such as passing on qualifications of applicants and collecting dues.

A board of trustees was appointed to consider acquiring a national engineering building in Chicago. It was announced that the city hall square building in Chicago might be purchased.

The same board of trustees will also consider the proposition of providing group insurance for members of the association.

Salaries of teachers in engineering colleges in the United States were recommended tentatively by A. N. Johnson, consulting highway engineer of the Portland Cement Association of Chicago, and Daniel L. Turner, chief engineer of the Transit Construction Commission of New York City, reporting for the committee on salaries of engineers in teaching service, of which Professor C. J. Tilden of Yale University is chairman. The dean of an engineering college is recommended for a salary of from $8,000 to $15,000 per annum, depending on the size of the college; professors, $5,000 to $12,000; associate professor, $4,000 to $9,000; assistant professor, $3,600 to $7,500; instructor, $3,000 to $4,000; assistant instructor $1,800 to $2,400.

Unionism in the engineering profession was strongly condemned in a resolution endorsing a statement issued by the Board of Directors of the association, reading in part as follows: "We believe in organized representation for the correction of wrong, the advancement of the engineering profession, and service to the public, but are opposed to methods inconsistent with the dignity of the profession and which would lessen public confidence in engineers. The American Association of Engineers, recognizing the many fundamental differences between the principles and objectives of the trade union and an organization of professional men, expresses the opinion that an engineer cannot subscribe to the tenets of both." The resolution recommended the expulsion from the association of engineers who advocate strikes or similar methods of securing their ends.

The association also decided to ask candidates for the presidency to declare themselves for or against the proposed national department of public works, for or against a national budget, for or against a constructional program of conservation of natural resources; and for or against reclamation of waste lands.

Another resolution declared that "adequate highway transportation is a prime requisite for the proper development of all sections of our country," and urged encouragement of worthy highway projects and the continuation of appropriations by Congress as Federal aid.

"One of the most important means of stabilizing conditions and values lies in greater individual application and industry," read another resolution, and it was enthusiastically adopted with a pledge that each member would direct his efforts toward the end aimed at by the resolution.

The following officers of the association were elected for the present year: president, L. K. Sherman; vice presidents, H. O. Garman and A. B. McDaniel; directors, Edmund T. Perkins, Charles A. Finley, W. C. Bolin, B. A. Bertenshaw, Professor Frederic Bass of the University of Minnesota, and R. W. Barnes. The next convention will be held in Buffalo, New York.

LOCAL ASSOCIATION OF MEMBERS OF AMERICAN SOCIETY OF CIVIL ENGINEERS.

San Francisco Association. Organized 1905. M. M. O'Shaughnessy, president; Nathan A. Bowers, secretary-treasurer, 502 Rialto Building, San Francisco, Cal.

The San Francisco Association of members of the American Society of Civil Engineers holds regular bimonthly meetings, with banquet and weekly informal luncheons. The former are held at 6 p. m. at the Engineers' Club, 57 Post Street, on the third Tuesday of February, April, June, August, October and December, the last being the annual meeting of the association.

Informal luncheons are held at noon every Wednesday, at the Engineers' Club, where special tables are reserved for members and guests of the association.

The by-laws of the association provide for the extension of hospitality to any member of the society who may be temporarily in

San Francisco, and any such member will be gladly welcomed as a guest.

Colorado Association. Organized 1908. W. C. Huntington, president; A. N. Miller, secretary-treasurer, 1400 West Colfax avenue, Denver, Colo.

The meetings of the Colorado Association of members of the American Society of Civil Engineers (Denver, Colo.) are held on the second Saturday of each month, except July and August.

Atlanta Association. Organized 1912. V. G. Kriegshaber, president; Howard L. Stillwell, secretary-treasurer, 533 Trust Co. of Georgia Bldg., care of Southeastern Underwriters' Association, Atlanta, Ga.

Informal luncheons are held for members of the association on the last Monday of each month, at 12.30 p. m.

Baltimore Association. Organized 1914. H. G. Perring, president, 3206 Carlisle avenue, Baltimore Md.

Cleveland Association. Organized 1914. W. P. Brown, president; George H. Tinker, secretary-treasurer, 516 Columbia Building, Cleveland, Ohio.

The regular meetings of the association are held on the second Wednesday of each month, at 12.15 p. m., in the rooms of the Electrical League, on the fourteenth floor of the Statler Hotel. Luncheon is served at these meetings, and visiting members are invited to attend.

Connecticut Association. Organized 1919. C. M. Seville, president; R. J. Ross, secretary, Municipal Building, Hartford, Conn.

The annual meeting of the association is held in April. The association also holds fortnightly meetings, alternating between Hartford and New Haven, Conn.

Detroit Association. Organized 1916. Lewis M. Gram, president; Dalton R. Wells, secretary-treasurer, 624 McKerchey Building, Detroit, Mich.

The regular meetings of the association are held on the second Friday of December, April and October, the last being the annual meeting.

District of Columbia Association. Organized 1916. David S. Carll, president; James H. Van Wagenen, secretary-treasurer, 719 Fifteenth street, N. W., Washington, D. C.

Duluth Association. Organized 1917. G. A. Taylor, president; Walter G. Zimmermann, secretary, Wolvin Building, Duluth, Minn.

The regular meetings of the association are held at noon on the third Monday of each month (usually at the Kitchi Gammi Club), with luncheon, followed by a short business session and the reading of papers.

National Association of Manufacturers.

At the convention held at the Waldorf-Astoria, New York, May 18, the association adopted "A Platform for American Industry" to be submitted to the Republican and Democratic conventions for incorporation in their national platforms. Before discussing this platform the delegates received the report of the committee on industrial betterment, health and safety which contained a bitter attack on the American Federation of Labor which, it asserted "Brazenly purposes to take the power of the government" by electing a president and congress that will do its bidding." The report referred to Samuel Gompers' defiant challenge to all opposing labor's ambitions in the coming election, and asserted that "labor has openly declared war, and is going to appeal to the public for whom they have no compassion when striking to gain their ends."

The principal planks in the platform are Government and Industry, Regulations of Combination, Private Employment, Relation (upholding individual bargaining) Taxation and Finance, (advocating the repeal of the excess profits tax), Transportation, Immigration (supporting selection and distribution of immigrants), Merchant Marine, Foreign Trade, War Bonus (general and indiscriminate distribution of cash bonus unjustified).

American Institute of Electrical Engineers.

At the annual meeting held May 21 at the building of the Engineering Society, New York, the Edison medal was presented to W. L. R. Emmet.

National Electric Light Association.

The 43rd annual convention of the National Electric Light Association was held at Pasadena, California, May 18-22nd. An important paper on Electric Machinery for All Handling-An Opportunity, by Zenas W. Carter, manager of the Material Handling Machinery Manufacturers' Association, New York, was presented under the auspices of the Electric Vehicle Section and the Commercial Section of the Convention. The paper which was separately published as pamphlet D 5-20, is handsomely illustrated with halftones of various kinds of electric plant in service, including girder cranes, elevators, hoists, industrial trucks, crane trucks, belt conveyors, gantry cranes, telphers, traveling cranes, and other items.

Iowa Engineering Society.

On April 22d and 23d delegates from state and local engineering clubs and societies in Iowa prepared a constitution for the Iowa Engineering Society, a consolidation of all the local technical societies and clubs in the state. The constitution is to be submitted to the different organizations and the vote for consolidation will be closed June 1. The local engineering clubs will become district clubs and will elect applicants to local membership which will entitle them to the membership in the state society.

The society will have an advisory council meeting twice annually to formulate policies and operations for the growth and activity of the society. Their recommendations will be submitted to the annual meetings of the society and if approved, will be carried out by an executive committee composed of the officers of the council who are also officers of the state society.

United Chamber of Commerce.

The U. S. Chamber of Commerce at its annual meeting in Atlantic City, April 26 to 29, elected two engineers as directors of the chamber.

Howard Elliott, member, American Society of Civil Engineers; chairman board, Northern Pacific R. R., New York City.

L. B. Stillwell, past-president, American Institute of Consulting Engineers and of American Society of Electrical Engineers; member, American Society of Civil Engineers; Electrical and Consulting Engineer, New York City.

The Industrial Relations Association of America.

The second annual convention of the above association will be held on May 19-20-21 at the Auditorium Hotel, Chicago. The proposed program announces the following among many other subjects prepared for discussion by prominent men:

Community Conditions Affecting Labor Stability; The Foreman; Wage Levels; Radicalism; Shortage of Labor; Developing the Industrial Relations Staff; Employment Office Methods; Public Utilities.

Organizing Conference.

Engineering societies taking part in the conference at Washington, June 3 and 4, will be entitled to representation there on the basis of one delegate for from 100 to 1,000 members, and not on the basis of one delegate for from 100 to 2,000 members as originally mistakenly announced.

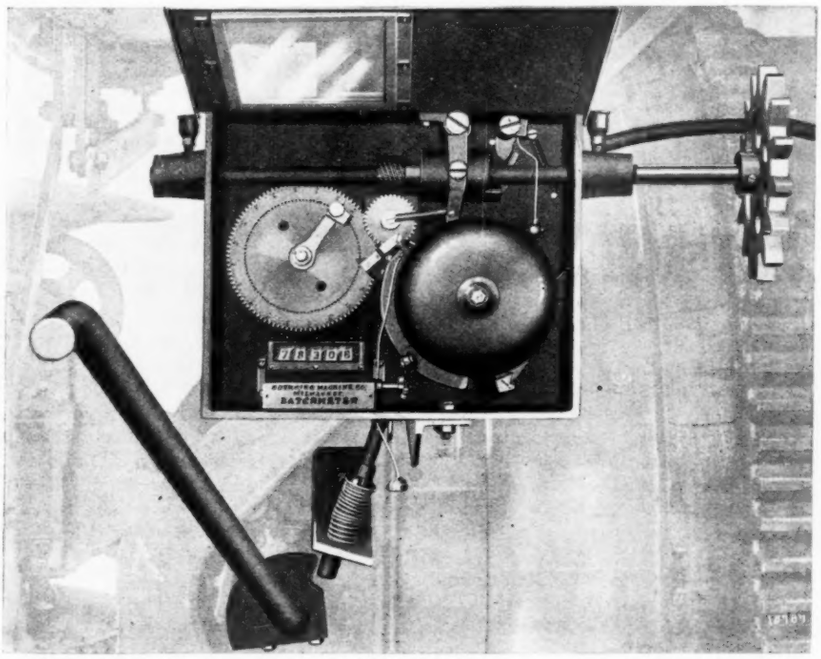
The Boston Society of Civil Engineers announces a field day program at Lake Suntang, Lynnfield, Mass., June 9. The excursion will be by train and auto buses, or by private automobiles. Dinner, dancing and athletic meet are promised.

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

KOEHRING BATCH METER.

The Koehring batch meter is a small clockwork instrument that, when attached to a concrete mixer, controls the operations of the latter so as to absolutely determine the time of mixing within fixed limits and records the number of batches mixed.

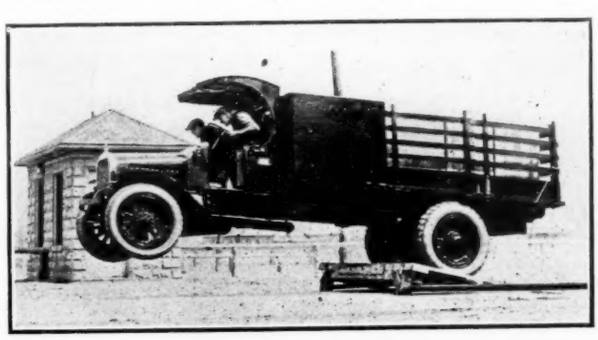


BATCH METER INSTALLED ON MIXER WITH DRIVING PINION ENGAGING MAIN GEAR.

When the loading skip reaches the charging position and the materials are entering the drum, the meter automatically locks the discharge chute and releases the latter at the expiration of any required period from three seconds to three minutes. This insures uniformity of concrete and regularity and volume of production, and affords a desirable basis of regulation both for engineer, inspector and contractor. The meter tends to prevent lost time by signalling with a gong as soon as the concrete is ready to be discharged, and maintaining the signal until it has been discharged, thus calling attention to any overmixing or idle time when the machine should be running and is not running. The meter can be attached to any mixer and, in combination with an automatic water measuring supply, insures high-grade concrete.

TRUCK AND TIRE TEST.

An interesting test intended primarily to demonstrate the efficiency of the Nobby Cord Truck Pneumatic Tires, which at the same time gave successful results for severe treatment of a two-ton Mack truck, were recently made at the tire factory at Providence, where a two-ton truck weighing 6,400 pounds and carrying a load of 4,400 pounds more, while running on an asphalt pavement, mounted a sharp incline 18 inches high at a speed of 20 miles per hour, jumping 18 feet before it struck the pavement.



JUMPING FROM 18-INCH BUMPER AT A SPEED OF 20 MILES PER HOUR.

The rear wheels were equipped with 8-inch and the front wheels with 6-inch tires, and the jump was made eight times without damaging them in any way. Afterwards the tires were dissected in search of evidence of damage, but none was found. Similar tests, made with a set of tires that had traveled more than 25,000 miles, were equally satisfactory and showed no injury to the tires.

On another occasion Nobby tires on a truck that, with its load, weighed 15,018 pounds were set close to the rails of a track oblique to the truck, so that one front wheel and one rear wheel were in contact with the rails, and when the truck engine was started, the wheels spun around with sufficient friction to make smoke and wear grooves in the wooden ties before the truck finally mounted the rails and moved across them, after which an examination disclosed no injury to the tires.

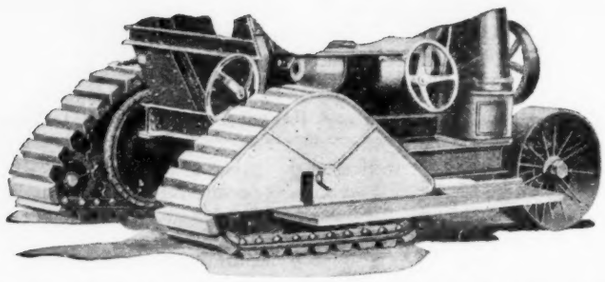
Reduced Waterproof Positive Prints from Tracings

Prints by a new process of duplicating tracings, photographically, known as the "Baker Print," are offered by the American Blue Print Paper Company. The duplications can be made on tracing cloth, paper or any pliable material. Reduced size can be effected, as well as making the prints same size as original tracings.

The duplicate tracings are covered with a waterproofing, the lines being chemically produced in the waterproofing. Corrections on the duplicates are made quickly because the lines erase very easily when removed with erasers, however, they do not wear off on the blue print machines, or from handling.

SMITH PAVER CATERPILLAR.

A novel feature of the Smith Simplex Paving Mixer is the interchangeability of the caterpillar and wheel traction. No changes in the drive, axles or axle brackets are necessary to change from one type to the other. The change can be made quickly and right on the job if necessary.



PAVER MOUNTED ON TRUCK EQUIPPED WITH IMPROVED CATERPILLAR TRACTION.

The caterpillar is of the triangular type, similar in operation to the caterpillar on the British tanks so successfully used in the world war. Inside the caterpillar are three wheels, the upper one of which serves as a tightener, which keeps the parts tightly in line and greatly reduces the wear on the moving parts.

Because of its triangular shape the Smith caterpillar never interferes with the movement of the distributing bucket. The boom can be swung freely at any angle without danger of the bucket coming in contact with the caterpillar.

With a 48x48-inch bearing surface the caterpillar distributes the weight of the paver over the ground at the rate of only 10 pounds per square inch. The height of the caterpillar, over all, is 40 inches; from center line to center line of the idlers is 48 inches. The treads of the caterpillar are made of oak blocks, protected with steel plates. Oversize Babbitt-lined bearings guarantee noiseless, easy propulsion. Idler sprockets are adjustable at both ends for taking up slack.

INDUSTRIAL NOTES.

Announcement by the Portland Cement Association.

J. W. Johnston becomes District Engineer in charge of the Milwaukee Office of the Portland Cement Association.

Mr. Johnston has been with the Association since July, 1916. Before joining our organization he had been City Engineer of Sioux Falls, S. Dakota, County Engineer of Minnehaha County, S. Dakota, and had served in various engineering capacities on railroad and general contracting work. For the past two years, Mr. Johnston has been District Engineer in charge of our Parkersburg, W. Va., Office.

J. H. Riddle, who since 1916 has been connected with the Parkersburg, W. Va., office of the Portland Cement Association, becomes District Engineer in charge of that office, succeeding J. W. Johnston, who has been transferred to the Milwaukee office as District Engineer in charge.

Mr. Riddle is well known in West Virginia, having been for a time County Engineer of Roane County, where he was identified with the construction of some of West Virginia's first concrete roads.

Announcement.

Older & Quinlan announce that their engineering practice has been merged with the practice of Arthur W. Consoer, under the corporate name of the Consoer Engineering Company. Clifford Older is president of this company, George A. Quinlan is secretary and treasurer, and Arthur W. Consoer assumes the duties of vice-president and business manager.

The consulting services of Mr. Older or Mr. Quinlan can be obtained by arrangement with this company, which will also conduct a general engineering practice with executive offices at 1654 Monadnock Block, Chicago.

Municipal paving, water supply, sewerage, drainage, bridges (particularly for cities and drainage districts), reinforced concrete grain elevators, fertilizer, storage tanks, and coal pockets, industrial buildings.

PERSONALS

Harder, H. J., city engineer of Paterson, N. J., has been appointed a member of the New Jersey State Department of Health.

Patstone, L. F., has resigned as city engineer of Manila, P. I., to enter the service of the China Commercial Development Company, Shanghai.

Graff, Major B. H., has been appointed highway engineer of the First Congressional District at Savannah, Ga.

Mitchell, Frank, has been appointed highwa yengineer of the Second Congressional District at Thomasville, Ga.

Caye, Captain W. A., Jr., has been appointed engineer of the Third Congressional District at Americus, Ga.

Smith, G. H., has been appointed engineer of the Fourth Congressional District at La Grange, Ga.

Hawkins, J. W., has been appointed engineer of the Fifth Congressional District at Atlanta, Ga.

Davis, E. H., has been appointed engineer of the Sixth Congressional District at Griffin, Ga.

Simonton, A. A., has been appointed engineer of the Seventh Congressional District, Georgia.

Goodwin, R. T., has been appointed engineer of the Eighth Congressional District, Athens, Ga.

Morgan, H. W., has been appointed engineer of the Ninth Congressional District at Gainesville, Ga.

Sherman, J. S., C. E., formerly with Sanitation Corporation, has joined the staff of the Sanitary Engineering Department of the Dorr Company, 280 Madison avenue, New York City.

Tiffany, R. K., project manager of the U. S. Reclamation Service, has resigned to open a consulting engineering office at Spokane, Washington.

Muldoon, H. R., has opened an engineering office at Spencer, West Virginia.

Read, L. C., has been appointed city engineer of Sandusky, Michigan.

Bayles, G. H., has been made chief engineer and superintendent of construction of the A. J. Krebs Company, builders, Atlanta, Georgia.

Leland, Prof. O. H., College of Civil Engineering, Cornell University, has accepted a position with the J. G. White Engineering Corporation, New York City.

Schlau, Samuel, has opened consulting engineering offices at 318 Greenwich street, New York City.

Mickey, D. D., has been appointed resident engineer of the Federal Aid Road Work in Jefferson County, Kansas with headquarters at Oskaloosa.

Payton, A. D., has been appointed city engineer and secretary of the Board of Local Improvements of Moline, Illinois.

Lawyer, Van E., has been made assistant supervisor of the New York State Highway Department.

Washington, C. C., has been appointed engineer of Galveston County, Texas.

Cheatham, C. V., has been appointed senior highway engineer for the U. S. Bureau of Public Roads in the district of Alaska.

Johnson, V. D., has been appointed engineer in charge of street construction, Roanoke, Virginia.

Seitz, W. K., has been appointed city engineer of St. Joseph, Missouri.

McCamman, J. R., has been appointed surveyor of Eaton County, Michigan.